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3.3.3 Distribution System

The distribution system consists of site piping between the CPE building and the two residences, as well as the plumbing distribution systems within each of the three buildings. The site piping between the CPE building and the east residence is 25 mm HDPE tubing. The water supply then passes through the east residence and leaves through a second 25 mm HDPE line that feeds the west residence. At the POE to each of the three buildings the 25 mm HDPE pipe is reduced down to a 19 mm copper pipe that feeds the buildings' plumbing supply. Each building supply has a shut off valve at the POE. As well, each lavatory and toilet have their own shut off valves. All three buildings have copper supply lines throughout. The POE and POU locations at the CPE building, and the east and west residences, are shown on Figures 04, 07 and 08, respectively.

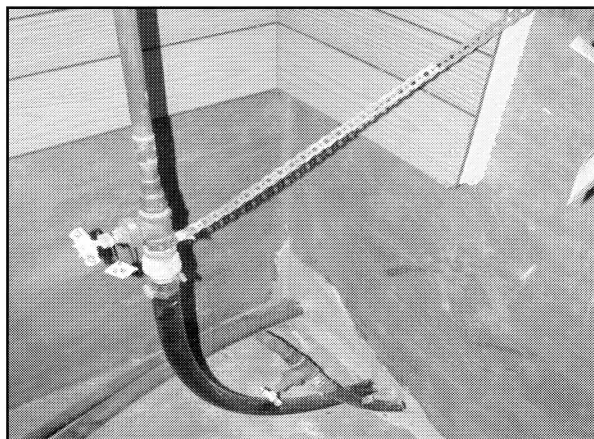


Photo 16: Water system POE at west residence.

The following is a list the fixtures present at the CPE building:

| Equipment Description | Location | Water Service Size | Comments |
|-----------------------|--------------------------------|--------------------|--|
| Toilet - 6L per flush | Staff Washroom | 12 mm COLD | |
| Hand Sink | Staff Washroom | 12 mm HOT/COLD | |
| Toilet - 6L per flush | Public Washroom | 12 mm COLD | |
| Hand Sink | Public Washroom | 12 mm HOT/COLD | |
| Toilet | 2 nd Floor Bathroom | 12 mm HOT/COLD | No Access |
| Hand Sink | 2 nd Floor Bathroom | 12 mm HOT/COLD | No access |
| Shower Head | 2 nd Floor Bathroom | 12 mm mixed | No access |
| Dish Sink | 2 nd Floor Kitchen | 12 mm HOT/COLD | |
| Wall Hydrant | Outside NE corner | 12 mm COLD | Non-freeze style with vacuum breaker. Untreated supply |

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The following is a list the fixtures present at the east residence:

| Equipment Description | Location | Water Service Size | Comments |
|-----------------------|--------------------|--------------------|---------------------------------------|
| Toilet - 6L per flush | Bathroom | 12 mm COLD | |
| Hand Sink | Bathroom | 12 mm HOT/COLD | |
| Bath tub Faucet | Bathroom | 12 mm HOT/COLD | |
| Shower Head | Bathroom | 12 mm mixed | |
| Dish Sink | Kitchen | 12 mm HOT/COLD | |
| Hot Water Tank | Basement | 12 mm COLD | 40 US gallon - gas heater |
| Wall Hydrant | Outside: NE corner | 12 mm COLD | Non-freeze style with vacuum breaker. |

The following is a list the fixtures present at the west residence:

| Equipment Description | Location | Water Service Size | Comments |
|-----------------------|--------------------|--------------------|---------------------------------------|
| Toilet - 6L per flush | Bathroom | 12 mm COLD | |
| Hand Sink | Bathroom | 12 mm HOT/COLD | |
| Bath tub Faucet | Bathroom | 12 mm HOT/COLD | |
| Shower Head | Bathroom | 12 mm mixed | |
| Dish Sink | Kitchen | 12 mm HOT/COLD | |
| Hot Water Tank | Basement | 19 mm COLD | 40 US gallon - gas heater |
| Washing Machine | Basement | 12 mm HOT/COLD | |
| Wall Hydrant | Outside: N side | 12 mm COLD | Non-freeze style with vacuum breaker. |
| Wall Hydrant | Outside: SE corner | 12 mm COLD | Non-freeze style with vacuum breaker. |

3.3.4 Historical Potable Water Quality

Previous reports provided by CBSA, indicates that water quality monitoring has been completed at the Wild Horse Border Crossing Facility, dating back to April 1993 ^(8 to 15), with annual sampling programs commencing in 2003/2004, and subsequent sampling programs completed in 2004/2005, 2006, 2008, 2010/2011 and 2011/2012. The following table provides an overview of the available water quality information, including the source of the data, the collection date, the sample locations and the type of analyses that were undertaken.

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| Data Source | Date (yyyy/mm/dd) | Sample Location (s) | Tested Parameters |
|--|--------------------------|---|---|
| EBA Engineering (in Golder, 2002) ⁽⁸⁾ | 1993/04/14 | Raw CPE Faucet | Micro/General (no analytical report provided) |
| Golder, 2002 ⁽⁸⁾ | 2001/11/29 | CPE Washroom After RO Treatment | Micro/General/VOCs/PAHs/ Metals/Herbicides/Pesticides |
| CBSA* | 2003/05/27 | CPE Office Res E and Res W | Micro |
| CBSA (e-mail) | 2003/10/?? | Unknown Location CPE Kitchen | Micro (no analytical report provided) |
| CBSA (e-mail) | 2004/05/?? | Two unknown locations | Micro/Metals (no analytical report provided) |
| CBSA * | 2004/09/29 | CPE Kitchen Res E and Res W | Micro/Turbidity |
| CBSA * | 2004/11/22 | CPE Kitchen Res E and Res W | Micro/Turbidity/Metals |
| EBA, 2005 ⁽⁹⁾ | 2005/03/10 | CPE Public Washroom After RO Treatment Res E and Res W | Micro/Turbidity |
| Earth Tech, 2005 ⁽¹⁰⁾ | 2005/09/13 | Outside tap (raw) CPE Staff Washroom CPE Public Washroom Res E and Res W | Micro/Turbidity (analytical results missing from report) |
| Earth Tech, 2005 ⁽¹⁵⁾ | 2005/10/30 | Outside tap (raw) CPE Staff Washroom CPE Public Washroom RO Tap Res E and Res W | Micro/Turbidity |
| Earth Tech, 2006 * | 2006/02/06 | Outside tap (raw) CPE Staff Washroom CPE Public Washroom Res E and Res W | Laboratory results missing |
| Earth Tech, 2006 * | 2006/10/19 | Outside tap (raw) After RO Treatment Bottled CPE Kitchen Res E and Res W | Micro/Turbidity/THMs |
| Pinchin, 2009 ⁽¹¹⁾ | 2008/12/29 | Raw CPE Washroom Bottled Res E and Res W | Micro/Turbidity/THMs |

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| Data Source | Date (yyyy/mm/dd) | Sample Location (s) | Tested Parameters |
|-------------------------------|--------------------------|---|---|
| Pinchin, 2009 ⁽¹²⁾ | 2009/03/03 | Raw CPE Washroom Bottled Res E and Res W | Micro/Turbidity/Metals |
| DST, 2011 ⁽¹³⁾ | 2010/12/19 | Raw CPE Kitchen Res E and Res W | Micro/General/Metals/THMs/VOCs/ Chlorine/Turbidity/Herbicides/ Pesticides |
| DST, 2011 ⁽¹³⁾ | 2011/02/15 | Raw CPE Kitchen | Micro/Turbidity |
| DST, 2012 ⁽¹⁴⁾ | 2011/07/28 | Raw CPE Kitchen | Micro/Turbidity |
| DST, 2012 ⁽¹⁴⁾ | 2011/09/22 | Raw CPE Kitchen | Micro/Turbidity/Metals |
| DST, 2012 ⁽¹⁴⁾ | 2011/11/12 | Raw CPE Kitchen | Micro/Turbidity |
| DST, 2012 ⁽¹⁴⁾ | 2012/02/04 | Raw CPE Kitchen | Micro/Turbidity |
| CBSA, 2012* | 2012/08/23 | Raw CPE Kitchen Bottled Res E and Res W | Micro/Turbidity/Metals |
| CBSA, 2013* | 2013/01/03 | Raw CPE Kitchen Bottled Res E and Res W | Micro/Turbidity |

CBSA* - no formal report, only the laboratory analytical data provided.
 Res E - east residence; Res W - west residence

The above referenced POE sample results, as obtained from the raw water (1989 well) at the CPE building, either from the outside tap (pre-Dec. 2008) or basement tap (post Dec. 2008), and POU sample results collected from the CPE and residential kitchen and washroom taps, were compared to the HC-GCDWQ maximum acceptable concentration (MAC), aesthetic objective (AO) or other guideline (OG).

Exceedances noted during these sampling events, which characterize the existing water supply, are summarized below. As tabled above, not all parameters were analyzed during each of these sampling events.

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| Date (yyyy/mm/dd) | Location | Parameter Exceedance | Result (mg/L unless noted) | HC-GCDWQ AO, OG or MAC (mg/L unless noted) |
|----------------------|-------------------------------------|--|--|---|
| 1993/04/14 | POU (CPE faucet) | HPC Sodium Sulphate TDS | 3,660 CFU/mL 1,220 2,095 3,591 | Elevated 200 (AO) 500 (AO) 500 (AO) |
| 2001/11/29 | POU (CPE public washroom) | Total Coliforms pH Sulphate Iron Lead Sodium Turbidity | > 40 MPN/100 mL 8.51 2,050 1.18 0.0347 1,060 4.3 NTU | 0 MPN/100 mL (MAC) 8.5 500 (AO) 0.3 (AO) 0.01 (MAC) 200 (AO) 0.1 NTU (OG) |
| 2001/11/29 | POU (from RO system) | Sulphate TDS Sodium | 2,030 3,360 1,080 | 500 (AO) 500 (AO) 200 (AO) |
| 2003/11 | POE | Total Coliforms | 2,000 MPN/100 mL | 0 MPN/100 mL (MAC) |
| | POU (CPE Kitchen) | Total Coliforms | 1,800 MPN/100 mL | 0 MPN/100 mL (MAC) |
| 2004/05 (e-mail) | Unknown | HPC Sodium | 7,200 CFU/mL 238 | Elevated 200 (AO) |
| | Unknown | HPC Sodium | 4,400 CFU/mL 244 | Elevated 200 (AO) |
| 2004/09/29 | POU (CPE Kitchen) | HPC | 56 CFU/mL | Elevated |
| | POU (Res E Kitchen) | HPC | 890 CFU/mL | Elevated |
| | POU (Res W Kitchen) | HPC | 750 CFU/mL | Elevated |
| 2004/11/22 | POU (CPE Kitchen) | Sodium | 1,150 | 200 (AO) |
| | POU (Res E Kitchen) | Sodium | 1.140 | 200 (AO) |
| | POU (Res W Kitchen) | Sodium | 1,150 | 200 (AO) |
| 2005/03/10 | POU (CPE public washroom) | HPC Total Coliforms | 12,000 CFU/ml 230 MPN/100 mL | Elevated 0 MPN/100 mL (MAC) |
| | POU (Res E Kitchen) | HPC Total Coliforms | 4,800 CFU/mL 130 MPN/100 mL | Elevated 0 MPN/100 mL (MAC) |
| | POU (Res W Kitchen) | HPC Total Coliforms | 11,000 CFU/mL 8 MPN/100 mL | Elevated 0 MPN/100 mL (MAC) |
| | POU (RO system) | HPC | 7,500 CFU/mL | Elevated |
| 2005/09/13 | POU (CPE outside tap, untreated) | <i>E.coli</i> Turbidity | 1 MPN/100 mL 2 NTU | 0 MPN/100 mL (MAC) 1.0 NTU (OG) |
| 2005/10/30 | POU (CPE outside tap, untreated) | HPC Turbidity | 1,100 CFU/mL 2.9 NTU | Elevated 1.0 NTU (OG) |
| | POU (Res E kitchen) | Total Coliforms | 16 MPN/100 mL | 0 MPN/100 mL (MAC) |

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| Date (yyyy/mm/dd) | Location | Parameter Exceedance | Result (mg/L unless noted) | HC-GCDWQ AO, OG or MAC (mg/L unless noted) |
|----------------------|-----------------------------------|-------------------------------------|-----------------------------------|--|
| 2006/02/06 | POU (CPE outside tap) | Sodium | 1,150 | 200 (AO) |
| | POU (CPE staff washroom) | Sodium | 1,250 | 200 (AO) |
| | POU (CPE public washroom) | Sodium | 1,130 | 200 (AO) |
| | POU (Res E kitchen) | Sodium | 1,300 | 200 (AO) |
| | POU (Res W kitchen) | HPC Sodium | 24,000 CFU/mL 1,100 | Elevated 200 (AO) |
| 2006/10/19 | POE (CPE basement tap, untreated) | HPC Turbidity | 470 CFU/mL 1.5 NTU | Elevated 1.0 NTU(OG) |
| | POU (RO tap) | HPC | 2,000 CFU/mL | Elevated |
| | POU (bottled water) | HPC | 3,700 CFU/mL | Elevated |
| 2008/12/29 | POE (CPE basement tap, untreated) | HPC | 900 CFU/mL | Elevated |
| | POU (CPE washroom) | HPC | 4,400 CFU/mL | Elevated |
| | POU (Res E kitchen) | HPC | 1,100 CFU/mL | Elevated |
| | POU (Res W kitchen) | HPC | 2,000 CFU/mL | Elevated |
| | POU (bottled water) | HPC | 320,000 CFU/mL | Elevated |
| 2009/03/03 | POE (CPE basement tap, untreated) | Sodium Turbidity | 1,180 1.5 NTU | 200 (AO) 1.0 NTU (OG) |
| | POU (Res W kitchen) | Iron Lead Sodium Turbidity | 0.38 0.019 1,190 1.3 NTU | 0.3 (AO) 0.01 (MAC) 200 (AO) 1.0 NTU (OG) |
| | POU (Res E kitchen) | Sodium | 1,180 | 200 (AO) |
| | POU (CPE kitchen) | Sodium | 1,180 | 200 (AO) |
| 2010/12/19 | POE (CPE basement tap, untreated) | pH Sodium Sulphate TDS | 8.59 1,200 1,900 3,300 | 8.5 200 (AO) 500 (AO) 500 (AO) |
| 2011/02/15 | POU (Res W kitchen) | Turbidity | 5.3 NTU | 1.0 NTU (OG) |
| 2011/07/28 | POE (CPE basement tap, untreated) | <i>E.coli</i> Total Coliforms | 1 MPN/100 mL 5 MPN/100 mL | 0 MPN/100 mL (MAC) 0 MPN/100 mL (MAC) |
| | POU (CPE kitchen) | Total Coliforms | 11 MPN/100 mL | 0 MPN/100 mL (MAC) |
| | POU (Res W kitchen) | Total Coliforms | 15 MPN/100 mL | 0 MPN/100 mL (MAC) |

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| Date (yyyy/mm/dd) | Location | Parameter Exceedance | Result (mg/L unless noted) | HC-GCDWQ AO, OG or MAC (mg/L unless noted) |
|----------------------|-----------------------------------|------------------------------|-------------------------------|--|
| 2011/09/22 | POE (CPE basement tap, untreated) | Iron Lead Sodium | 1.1 0.055 1,100 | 0.3 (AO) 0.01(MAC) 200 (AO) |
| | POU (CPE kitchen) | Sodium | 1,200 | 200 (AO) |
| | POU (Res E kitchen) | Sodium | 1,100 | 200 (AO) |
| | POU (Res W kitchen) | Sodium | 1,200 | 200 (AO) |
| 2011/11/12 | POE (CPE basement tap, untreated) | Total Coliforms Turbidity | 1 MPN/100 mL 31 NTU | 0 MPN/100 mL (MAC) 1.0 NTU (OG) |
| | POU (Res W kitchen) | Total Coliforms | 1 MPN/100 mL | 0 MPN/100 mL (MAC) |
| 2012/02/04 | POE (CPE basement tap, untreated) | Turbidity | 45 NTU | 1.0 NTU (OG) |
| 2012/08/23 | POE (CPE basement tap, untreated) | Sodium | 1,200 | 200 (AO) |
| | POU (CPE kitchen) | Sodium | 1,200 | 200 (AO) |
| | POU (Res W) | Sodium | 1,200 | 200 (AO) |
| | POU (Res E) | Sodium | 1,200 | 200 (AO) |

Res E - east residence; Res W - west residence

With the exception of turbidity, the aesthetic objective and other guideline exceedances tabled above are not a direct human health concern, and can be addressed by proper water treatment system design, operation and maintenance. Previous water quality reports for the Wild Horse Border Crossing Facility have interpreted the HC-GCDWQ for turbidity based on the classification of the aquifer as a secure groundwater source. Based on the analytical data, which shows periodic exceedances and seasonal fluctuations, the aquifer should be considered groundwater under the direct influence of surface water (GUDI). For GUIDI and the type of filtration system used at Wild Horse, the turbidity guideline should be ≤ 1.0 NTU in at least 95% of the measurements made, never to exceed 3.0 NTU. The turbidity guideline only applies to the treated water (POU) samples.

The *E.coli* result from July 2011 (1 MPN/100 ml) and total coliform results from November 2003 (2,000 MPN/100 ml), July 2011 (5 MPN/100 ml) and November 2011 (1 MPN/100 ml), indicated contamination of the current well and/or raw water source. Similarly, the POU *E.coli* result from September 2005 (CPE building - 1 MPN/100 ml) and the POU total coliform results from November 2001 (CPE building - >40 MPN/100 ml), November 2003 (CPE building - 1,800 MPN/100 ml), March 2005 (CPE building - 230 MPN/100 ml, east residence - 130 MPN/100ml and west residence - 8 MPN/100 ml), October 2005 (east residence - 16 MPN/100 ml), July 2011 (CPE building - 11 MPN/100 ml and west residence - 15 MPN/100 ml) and November 2011 (west residence - 1 MPN/100 ml), indicated contamination from the source and/or the distribution system. Elevated HPC results of up to 12,000 CFU/ml in the POE/POU samples and 320,000 CFU/ml in a bottled water sample also suggest there is bacteriological contamination within the water distribution system.

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Records provided by CBSA indicate that the current well was shock chlorinated in the fall of 2004, January 2006 and November/December 2011. The chlorination events in 2006 and 2011 were specifically conducted based on the water quality results. The most recently reported sampling results from February 2012 indicated no bacteriological concentrations at the POE or POU sampling locations. CBSA also provided two recent sets of test results, one from August 2012 and one from January 2013, which also did not show any bacteriological impacts, indicating that the shock chlorination has been an effective corrective action. However, based on the previous positive test results for the microbiological parameters, the system is still deemed non-potable, until there is more frequent monitoring of the water quality or the inclusion of both chlorination and UV disinfection to inactivate pathogens and viruses using a multi-barrier approach.

A review of the general chemistry and metal parameters within the raw water and treated water sources shows consistently elevated levels of sodium, typically ranging between 1,060 and 1,250 mg/L. Results show no significant difference in sodium concentrations between the pre and post-treatment samples. A comparison of metal parameters from the untreated POE and treated POU locations in each of the buildings show a slight reduction in arsenic, boron, manganese and uranium concentrations, and significant reductions in cadmium, copper, iron, lead and zinc, where treated sample concentrations were reduced by at least two orders of magnitude, and in some instances to levels below the laboratory method detection limit.

3.3.5 Inspections and Maintenance Activities

Inspections and maintenance are currently conducted by Mr. Lyle Stenger, from Stenger's Plumbing and Heating Ltd. Mr. Stenger indicated that the typical service interval was to be once per year, but due to issues with the system in 2011-2012, he has visited the site on a more frequent basis. Mr. Stenger reported that additional trips were required to upgrade the treatment equipment in 2011 and 2012, and to replace the UV reactor in September of 2012 due to damage.

Stenger's Plumbing and Heating Ltd. has provided a detailed manual on site, listing all of the equipment and associated data. The manual is a compilation of equipment specification sheets. There are some Standard Operating Procedures and Maintenance Log templates provided on site, with past records of the Maintenance Logs dating back to 2004 on some of the equipment. The last recorded date in the logs was October 2011.

Copies of the system maintenance records are provided in Appendix D and a copy of the equipment manual is provided in Appendix E. Copies of other relevant documents obtained during the assessment are provided in Appendix F.

The following table is a summary of the maintenance records related to the water source, water treatment system and wastewater systems installed in the current CPE building and two residences.

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| Maintenance Records (Work Order Number) | Date (yyyy/mm/dd) | Description of Work |
|--|----------------------------|---|
| WO 6274 | 2006/03/20 | Performed maintenance of UV system and installed new control box. Repaired sewer drain lines in CPE building. Installed new sump pump in east residence. Repaired effluent pump in east residence. Inspected CPE septic tank and noted sewage effluent overflowed tank onto the surrounding soil due to pump failure. |
| WO 7217 | 2011/06/16 | Performed maintenance of UV system, replaced lamp and sensor. Checked and adjusted MMF and iron guard softener. Investigated source of sewer gas odour in CPE building. |
| WO 7218 | 2011/07/14 - 2011/11/15 | Noted iron on UV sterilizer quartz sleeve causing alarm condition. Believed increased water use too much for single tank iron guard water softener. Installed new twin-tank system on June 28, 2011. UV system alarmed again 15 days later. Suggested organic irons may be passing through the system and would be organically bound to tannins. Installed test tank water softener for tannin removal. Reported bypass valve on UV system opened and contaminated well water entered the system. Reported no salt in brine tank. Investigated problem. |
| WO 7224 | 2011/06/28 - 2011/09/12 | Installed new twin meter water softener to replace Iron Guard water softener. Noted sediment in the 5 micron sump filter and planned to replace the distributor tube and media bed in the MMF. Performed maintenance on the water treatment system and filled Res Care feeder. |
| WO 7285 | 2011/11/29 | Took measurements/photos of buildings, wells, septic tanks, effluent ejectors. Performed shock chlorination of well and distribution system using 12% bleach. Noted potential for contamination of water source due to proximity of ejectors to wells, abandoned wells, previous septic tank leaks and existing septic tank overflow in 2006. |
| WO 7316 | 2012/02/29 | Upgraded O & M Manual for new tannins removal softener and provided instructions for shock chlorination. |
| WO 7332 | 2012/03/26 | Installed duplex alternating water softener for tannins removal. |

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3.3.6 Bottled Water Usage

Potable water for the Wild Horse Border Crossing Facility is provided through 20 L bottled water dispensers. The 20 L bottles were previously refilled on site from a reverse osmosis treatment system in the basement of the CPE building. However, recently the Facility began obtaining bottled water from a third party supplier in Lethbridge, Pure & Simple Water. The CPE building and residences each have individual water cooler dispensers for use by CBSA staff. There were no readily accessible instructions for sanitization of the units on site and there were no written records when the last cleaning took place. Extra full and empty bottles are stored in the CPE building next to the bottled water dispenser.

| Equipment Location | Year Installed | Quantity | Manufacturer | Model Number |
|--------------------|----------------|----------|--------------|--------------|
| CPE Building | 2004 | 1 | EBCO | B1SRPK-0101 |
| West Residence | 2004 | 1 | Greenway | GWD200W |
| East Residence | 2004 | 1 | Greenway | GWD200W |



Photos 17 and 18: Bottled water dispensers at the CPE building (left) and west residence (right).

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4.0 RESULTS

4.1 OBSERVATIONS AND FINDINGS BASED ON THE INSPECTION, INTERVIEWS AND CBSA CHECKLIST

The site visit on October 26, 2012 found the water treatment equipment operating in an acceptable manner. The equipment started operation and stopped operation in their intended manner. The salt and Res Care additive were at adequate levels in the brine tanks. The treated water was visually aesthetic, with no discoloration or odor. Signs were posted at all consumption points in the CPE building and the two residence buildings, indicating that the water was non-potable and should not be consumed.

The following is a list of issues and comments noted from the site visit, inspection and interviews. A copy of the detailed CBSA Assessment Checklist is provided in Appendix G. Photographs highlighting these issues of concern are presented in Appendix B.

| Item | Issues & Comments |
|---------------------------|---|
| Source Water and Wellhead | <ul style="list-style-type: none"> • Poor drainage away from the wellhead. • Septic tank and septic field located in close proximity to the wellhead. • Septic ejectors located close to the wellhead and property line. • Former ASTs located in CPE building, close to the wellhead. • Former AST inside west residence, located near wellhead. • Potential USTs located near wellhead. • Former landfill (dump site) located near wellhead. |
| Raw Water Supply Pipe | <ul style="list-style-type: none"> • No items noted. |
| Hydro Pneumatic Tank | <ul style="list-style-type: none"> • No items noted. |
| Pressure Switch | <ul style="list-style-type: none"> • No items noted. |
| Multimedia Filter | <ul style="list-style-type: none"> • No items noted. |
| MMF Control Valve | <ul style="list-style-type: none"> • No items noted. |
| Iron Guard Softener | <ul style="list-style-type: none"> • No items noted. |
| Softener Control Valve | <ul style="list-style-type: none"> • No items noted. |
| Brine Tank | <ul style="list-style-type: none"> • No items noted. |
| Tannin Removal | <ul style="list-style-type: none"> • No items noted. |
| UV Reactor | <ul style="list-style-type: none"> • The installed UV system should be upgraded to a different model that is NSF Standard 55 Class A. |
| Building Plumbing | <ul style="list-style-type: none"> • No items noted. |

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|--|--|
| Maintenance Intervals | <ul style="list-style-type: none"> The maintenance schedule may have to be modified to allow for trips to site to replenish the brine tank salt and chemical. This could also be coordinated with the designated PWGSC representative. |
| Interviews with Staff | <ul style="list-style-type: none"> No items noted. |
| Site Observations | <ul style="list-style-type: none"> The bottled water supply is only available to staff. There is no potable water supply for the public who use the washroom facilities. There are no hand sanitizers for use in the washrooms and there is a risk that pathogens and viruses can be transferred after washing hands in non-potable water. |
| Reverse Osmosis for Drinking Water | <ul style="list-style-type: none"> There may be some misconception that the reverse osmosis treatment system will remove any pathogens or viruses remaining in the treated water. This cannot be guaranteed with the currently installed system because, as with many RO systems, there is no form of "integrity" testing to prove that contaminated water has not "leaked" around the membrane. Primary disinfection with chlorine and UV disinfection for multi-barrier treatment would be required to achieve sufficient pathogen and virus inactivation. Reverse Osmosis also has no nutritional value as drinking water. It does not contain the typical essential minerals commonly found in municipal water supplies. It is typically not recommended that pure deionized RO water be the only form of water consumed by individuals. |
| No Disinfection in Distribution System | <ul style="list-style-type: none"> The facility does not employ any form of primary disinfection. Due to a history of microbiological contamination in the raw water supply, the system should include both chlorine and UV disinfection to inactivate pathogens and viruses using a multi-barrier approach. As an option, due to the small size and remote location of the facility, the micro-system could employ UV as the primary disinfection option, as long as there was stringent and frequent monitoring of the water quality, and bottled water was available on-site at all times and used as the primary potable water supply. |

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4.2 VULNERABILITIES AND RISKS AND USERS OF THE POTABLE WATER SYSTEM

The potable water supply is bottled water delivered in 20 L containers. Other than ensuring regular maintenance of the dispensing units to ensure proper operation and performing monthly disinfection to eliminate potential bacteriological growth, there is minimal risk with the current bottled water system.

The current CPE building water treatment system is not adequate to deal with any pathogens in the water source, therefore, it is deemed non-potable. All of the plumbing fixtures in the building are then deemed non-potable and should continue to be displayed as such, with adequate signage. The supply of non-potable water to a public facility is a source of risk and vulnerability to staff and visitors, as many people by habit do not think twice about consuming water from a tap (e.g. brushing teeth, washing hands, showering). The regular staff may be well aware that the water is non-potable, but visitors and the public may not be fully aware of the situation, and there is risk that they could consume the water from the taps.

The public washroom facility has no access to potable water. A bottled water dispenser should be located in an area clearly accessible to the public. It should be noted that the exterior wall hydrant on the CPE building is connected to the raw water supply ahead of the building treatment system. If the treatment system is upgraded to potable use, this tap will still remain non-potable.

It is not uncommon to find total coliforms in untreated groundwater in rural agricultural areas. Total coliforms are naturally occurring in the soil and in the gut of humans and animals, while *E.coli* are present only in the gut of humans and animals ⁽³⁾. Based on the location and construction of the current and former wells, the most likely source and pathway for well and/or aquifer contamination is surface water run-off occurring directly into improperly constructed, sealed, capped or abandoned wells. This conclusion is supported by the historical information, which indicated that previous wellheads operated in close proximity to septic tanks, septic ejectors and former septic fields.

In addition, an undocumented well may exist at the site, and it is not known if a proper seal was made or if the well was leaking while it operated or if proper decommissioning was completed. There is also potential for impacts from a former landfill that was located northeast of the CPE building. On a regional basis, off-site agricultural land use may also be contributing to the overall contamination of the regional aquifer and the issues related to coliforms may be the result of factors outside the property boundary.

The presence of the septic tanks and ejectors on-site presents a potential vulnerability to the groundwater supply. The historic operation of a septic system at the site, likely since the property was developed in 1928, has provided a long-term source of potential contaminants to the aquifer. The septic ejectors are located north of the buildings, and the ejector north of the CPE building does not meet the provincial setback distance of 50 m from the wellhead and none of the ejectors meet the setback distance of 90 m from the property line. The west ejector does not meet the setback distance of 45 m from a building.

Other potential risks to the aquifer from on-site activities include the former use of heating fuel, which has historically been stored in both underground and aboveground storage tanks (USTs and ASTs).

The following is a list of the risks and vulnerabilities noted from the site visit and interviews:

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| Item | Risks and Vulnerabilities | Level of Risk |
|---|--|---|
| Source Water Protection | <ul style="list-style-type: none"> • The presence of septic tanks on-site and operation of septic ejectors north of the buildings increases the vulnerability of the local and regional aquifer to contamination. • The practice of surface discharge of wastewater on the property should be discontinued as this practice poses a risk to the well head and source water contamination. The ejectors do not meet the setback distance of 90 m from the property line or 50 m from a well. • The surrounding agricultural and livestock land use increases the vulnerability of the regional aquifer. • The presence of former on-site ASTs and USTs containing heating oil increases the vulnerability of the local aquifer to contamination. • The presence of a former landfill (dump site) north of the CPE building increases the vulnerability of the local aquifer to contamination. • The presence of three abandoned wells, and possibly the presence of an additional abandoned well at an unknown location, increases the vulnerability of the local aquifer to contamination. | <ul style="list-style-type: none"> • Low • Medium • Low • Low • Medium • Medium |
| Wellhead Protection | <ul style="list-style-type: none"> • Poor drainage away from the wellhead increases the vulnerability of the aquifer to contamination from surface infiltration along the well casing or directly into the well head. | <ul style="list-style-type: none"> • Medium |
| CPE Building Water Treatment System and Distribution System | <ul style="list-style-type: none"> • The current water treatment system is not adequate to achieve sufficient pathogen and virus inactivation. With a history of positive results for microbiological contamination of the raw water source, the system should be upgraded, with primary disinfection through chlorine, and UV disinfection retained for multi-barrier treatment. The system is vulnerable to the transmission of pathogens and viruses to the users, even when not consuming the water. | <ul style="list-style-type: none"> • Medium |
| No Chlorine Residual in Distribution System | <ul style="list-style-type: none"> • Lack of chlorine residual in the distribution system increases the risk that bacterial amplification may occur and that pathogens can be transmitted by the water distribution system. Although a chlorine residual is not technically required for a micro-system, it may still occur when chlorine is used as a disinfectant. | <ul style="list-style-type: none"> • Low |

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| Item | Risks and Vulnerabilities | Level of Risk |
|---|---|--|
| Bottled Water Supply for Public Use | <ul style="list-style-type: none"> The only bottled water supply is located in the staff area. Without an obvious source of potable water for the public, there is a risk that visitors to the facility may drink water in the public washroom. | <ul style="list-style-type: none"> Low |
| Hand Washing in Public Washroom | <ul style="list-style-type: none"> There is a risk that pathogens and viruses can be transferred after washing hands in non-potable water. The lack of a hand sanitizer and instructions for use in the washroom increases the risk of this transfer. | <ul style="list-style-type: none"> Low |
| Regular Maintenance of Bottled Water Dispensers | <ul style="list-style-type: none"> Bottled water systems have the potential to develop bacterial growth without proper and regular maintenance to sanitize the system. | <ul style="list-style-type: none"> Low |
| Providing Non-Potable Water to Living Quarters (East and West Residences) | <ul style="list-style-type: none"> The CBSA employees reside both on-site and off-site, and therefore, a habit change is required when living on-site to adjust to the non-potable water source and to avoid consumption of the water. There is an increased risk for ingestion based on habits developed from living with potable water. Individuals who live with non-potable water develop stronger habits to avoid unnecessary consumption of the water, and they can also develop some tolerance to the specific water quality. The CBSA employees may accidentally ingest non-potable water during normal activities such as brushing teeth, washing hands, washing food and showering (see below). | <ul style="list-style-type: none"> Low Low |
| Presence of Showers | <ul style="list-style-type: none"> The showers in all three buildings are supplied with non-potable water, which increases the risk of ingestion of non-potable water and/or inhalation of non-potable water vapor, thereby transferring pathogens and viruses to the user. | <ul style="list-style-type: none"> Low |
| UV System Not Certified | <ul style="list-style-type: none"> The UV unit for a small public water system such as the CBSA Wild Horse Facility is required to be Certified NSF Standard 55 Class A. The existing UV unit (Sterilight Cobalt SCM-320) is not certified to the required standard for a public water system. The manufacturer recommends primary disinfection (chlorination) prior to secondary disinfection (UV) for this reactor model. | <ul style="list-style-type: none"> Medium Medium |

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 RISKS TO EMPLOYEES AND VISITORS

Other than ensuring regular maintenance and disinfection of the bottled water dispensing unit, there is minimal risk associated with the bottled water supply and use on-site.

However, with the historical contamination of the on-site well supply, the entire building plumbing supply is deemed non-potable for health reasons. The raw water is currently treated for aesthetics, with hardness and iron removal, but the current treatment equipment does not provide an adequate barrier to pathogens and viruses.

The supply of non-potable water to the staff and public washrooms poses a health risk if the source has been contaminated. The practice of washing hands, brushing teeth and taking a shower could expose the employees and visitors to un-safe water. With no residual disinfection in the building plumbing supply there is also the potential for bacterial colonies to form in stagnant pipes and fixtures.

5.2 RECOMMENDATIONS FOR CORRECTIVE ACTIONS

Based on the small size of the facility, and the use of the bath and shower facilities by employees, it is recommended that the building water treatment system be upgraded to provide pathogen and virus protection. This should include the addition of primary disinfection with residual chlorine in the distribution system followed by secondary disinfection by UV for giardia, cryptosporidium and bacteria inactivation.

It is also important to provide proper drainage away from the well to ensure that water does not collect around the wellhead. Therefore, it is recommended that drainage improvements be made around the existing well to ensure proper drainage away from the wellhead. Additionally, surface discharge of wastewater effluent likely contributes to contamination of the local aquifer. This practice should be discontinued and replaced by septic fields located at the northern boundary of the site to obtain the proper set-back distance from the well. The concrete septic tank at the CPE Building should also be replaced with a fibreglass tank.

The following is a list of recommendations for corrective actions for the critical items, specifically health and safety based issues. There are no recommendations required for corrective actions for non-critical items.

| Critical Issues | Corrective Action(s) |
|---------------------|---|
| Presence of Showers | <ul style="list-style-type: none"> Provide warning signs to indicate "Do not ingest any water. Wash hands with disinfectant after showering". Alternatively, provide a potable water supply to the showers. |

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| Critical Issues | Corrective Action(s) |
|---|--|
| Hand Washing in Public Washroom | <ul style="list-style-type: none"> • Install hand sanitizer and instructions for use in the washrooms within the CPE building and residences. • Ensure that the existing signs that indicate “Do Not Drink - Non-Potable Water” are maintained in clearly visible locations. |
| Bottled Water Supply for Public Use | <ul style="list-style-type: none"> • Install a second bottled water dispenser in a public access area at the CPE building. • Clearly label the bottled water systems to indicate they are the only potable water source in the buildings. |
| CPE Building Water Treatment System and No Chlorine Residual in the Distribution System | <ul style="list-style-type: none"> • With positive results indicating a history of contamination of the raw water supply, the water treatment system should be upgraded, with primary disinfection using chlorine, and UV disinfection retained for multi-barrier treatment to address pathogens and viruses present in the raw water source. This would include upgrading the UV system to be Certified NSF Standard 55 Class A. • Due to the limited number of staff and visitors, the water system is classified as a micro-system. The 2009 Guidance for Providing Safe Drinking Water in Areas of Federal Jurisdiction states that chlorine residuals (secondary disinfection) are not required for micro-systems. However, primary disinfection is recommended for virus and pathogen inactivation. Therefore, it is recommended that chlorine be added for primary disinfection for inactivation of pathogens and viruses. • As an option, UV disinfection could be used without chlorine disinfection (as per the present situation), to supply water to the sinks, toilets and showers, but this system is not recommended for potable water use. If UV disinfection was retained without chlorine, there would need to be a stringent and frequent monitoring program for bacteriological parameters, and the bottled water systems would need to be maintained on-site as the primary potable water supply. • Until chlorine disinfection is added to the treatment process, the site should develop a regular flushing sanitization program of the building plumbing system to mitigate against bacterial growth in the system. • Regular sampling at all POU locations for HPC will help to indicate the presence of bacteria colonies and dictate the sanitization frequency. |
| Regular Maintenance of Bottled Water Dispensers | <ul style="list-style-type: none"> • Prepare and implement a maintenance schedule for regular sanitization of the current bottled water dispensers (at least two to three times per year) to help prevent bacterial contamination of the dispensing units. |

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| Critical Issues | Corrective Action(s) |
|-------------------------|---|
| Source Water Protection | <ul style="list-style-type: none"> Upgrade the water treatment system with the primary disinfection system as noted above to provide multi-barrier treatment and protection for users against a contaminated water source. The practice of surface discharge of wastewater on the property should be discontinued, as it continues to pose a risk to the well head and source water contamination, and may reduce the benefits of shock chlorination treatments by re-contaminating the water supply. There is no location available on-site that meets the setback distance of 90 m from a property line. The ejector discharge system should be replaced with septic leaching beds located at least 15 m (preferably greater) from the water well. The concrete septic tank at the CPE building should also be replaced with a fibreglass tank. Properly decommission all former wells located on the property. |
| Wellhead Protection | <ul style="list-style-type: none"> Complete earth works to provide at least a 300 to 400 mm mound around the well casing and positive drainage away from wellhead. |

5.3 COST ESTIMATE FOR CORRECTIVE ACTIONS

Based on the work detailed in the previous tables, the following is the budget cost to execute the work:

| Critical Issues | Action By | Budget Cost |
|---|------------|-----------------|
| Disable Showers in Washrooms | Contractor | \$1,500.00 |
| Install Hand Sanitizers in Washrooms | Contractor | \$500.00 |
| Install Second Bottled Water Dispenser | PWGSC | \$500.00 |
| Regular Maintenance (Disinfection) of Bottled Water Dispensers | PWGSC | \$1,000.00/year |
| Upgrade Water Treatment System with Primary Disinfection (chlorine and contact tanks) and Ensure UV system is NSF Standard 55 Class A | Contractor | \$15,000.00 |
| Wellhead Protection | Contractor | \$500.00 |
| SOP Manual | PWGSC/EGE | n/a |
| Eliminate Surface Discharge of Wastewater | PWGSC | \$50,000 |
| Decommission Three Abandoned Wells | PWGSC | \$25,000 |

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The annual operating and maintenance cost for the recommended upgraded water treatment system, which includes the addition of primary disinfection and continued operation of the existing UV system (upgraded to NSF Standard 55 Class A), is \$1,000 per year for chemicals such as chlorine, RES Care, salt and resin top up; and replaceable or consumable parts such as UV lamps and sleeves, and chemical feed pump seals.

An additional cost to consider would be regular maintenance labour for the equipment. A monthly visit by the current contractor is estimated at \$1,000 per trip or \$12,000 per year, including time and travel expenses. Alternatively, the PWGSC representative could take responsibility for some of the regular maintenance to save on the operation and maintenance costs.

5.4 RECOMMENDED SAMPLING REGIME (PARAMETERS AND FREQUENCY)

5.4.1 Existing Water System

Since the potable water supplied to the site is bottled, the bottled water dispensers should be monitored twice yearly for microbiological parameters (total coliforms and *E.coli*) to assist in evaluating the effectiveness of the recommended sanitization protocol. As a check on the supplied bottled water source, the twice yearly sampling procedure should also include metals and general chemistry. HPC should also be considered as an optional test to monitor bacteriological growth at the bottled water dispenser.

The water treatment system at the Wild Horse Border Crossing Facility is considered a micro-system. However, all water systems operated by the Government of Canada, which service up to 5,000 people, regardless of size, require sampling for total coliforms and *E.coli* four times per month. This frequency can be reduced to quarterly sampling for micro-systems, with non-disinfected groundwater supplies, and to semi-annual for disinfected groundwater supplies, if one of two conditions are met: the completion of a vulnerabilities assessment, with acceptable results; or a history of acceptable bacteriological quality.

The current vulnerabilities assessment has identified several potential risks to the groundwater supply and treatment system, and the raw water source was considered non-potable after the results of the November 2011 sampling indicated the presence of total coliforms in both the raw and treated water. However, the groundwater well was subsequently shock chlorinated in November/December 2011, and the tests completed after chlorination did not indicate the presence of coliforms in the water. On this basis, CBSA considers the recent tests for water quality, to represent an acceptable history, therefore, one of the two conditions has been met and the monitoring frequency of quarterly microbiological sampling for micro-systems, with non-disinfected groundwater supplies, is appropriate for the Wild Horse site.

The quarterly sampling should include: the microbiological parameters (total coliforms and *E.coli*); total metals; and general chemistry, including turbidity. The POU locations and the raw water source should be included in the quarterly sampling, to evaluate whether biological amplification is occurring within the treatment and distribution system, and to assist in developing short term mitigation measures. The POU locations that require sampling include: the CPE staff washroom sink; the CPE public washroom sink; the CPE bottled water dispenser; the CPE 2nd floor washroom sink; the CPE 2nd floor kitchen sink; the east

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residence washroom sink; the east residence kitchen sink; the east residence bottled water dispenser; the west residence washroom sink; the west residence kitchen sink; and the west residence bottled water dispenser. The quarterly sampling should be scheduled to include the periods when the risk of contamination to the groundwater is the highest (spring and fall). HPC should also be considered as an optional test to monitor bacteriological growth within the distribution system.

The recommended sampling program for the Wild Horse Border Crossing Facility, including the parameters and frequency, is provided in the table below.

| Locations | Parameters | Frequency |
|---|---|--|
| POE - CPE basement sample tap POU - CPE staff washroom sink POU - CPE public washroom sink POU - CPE 2 nd floor washroom sink POU - CPE 2 nd floor kitchen sink POU - ER washroom sink POU - ER kitchen sink POU - WR washroom sink POU - WR kitchen sink | Microbiological (total coliforms and <i>E.coli</i>) Total Metals (Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cr+6, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, U, V, Zn) Routine Water - General Chemistry (total and pp alkalinity, HCO ₃ , CO ₃ , EC, OH, ion balance, ion sum, dissolved (Ca, Fe, K, Mg, Mn, Na), Cl, SO ₄ , NO ₃ , NO ₂ , NO ₃ -N+NO ₂ -N, pH, hardness, TDS and turbidity) | Four times per year (January, April, July and October) |
| POU - CPE bottled water POU - ER bottled water POU - WR bottled water | Microbiological (total coliforms and <i>E.coli</i>) Total Metals (Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cr+6, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, U, V, Zn) Routine Water - General Chemistry (total and pp alkalinity, HCO ₃ , CO ₃ , EC, OH, ion balance, ion sum, dissolved (Ca, Fe, K, Mg, Mn, Na), Cl, SO ₄ , NO ₃ , NO ₂ , NO ₃ -N+NO ₂ -N, pH, hardness, TDS and turbidity) | Two times per year (April and October) |

Consideration should also be given to periodic sampling and testing for petroleum hydrocarbons, based on the former presence of heating oil storage tanks at the site. This should include analysis of the BTEX parameters and the petroleum hydrocarbon (PHC) F1 to F4 Fractions.

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5.4.2 Future Water System

If the corrective actions recommended in this report are undertaken, particularly with respect to primary chlorine disinfection, a revised sampling regime is recommended. The HC guidance document ⁽³⁾ requires that raw or renovated drinking water systems and/or systems where a monitoring history has not yet been established, must establish a history of acceptable bacteriological quality by sampling for total coliforms and E.coli four times per month for one year.

For very small systems, CBSA may choose to accept either a vulnerabilities assessment with acceptable results, or a history of acceptable bacteriological quality, to implement a reduced monitoring frequency. In addition, for GUDI systems, CBSA may choose to reduce the monitoring frequency for turbidity and chlorine residual, if they are satisfied that they have in place adequate strategies to ensure health protection. The monitoring program for the Wild Horse micro-system, once the conditions for reduced monitoring as outlined above are met, is:

- Total coliforms, E.coli - quarterly at the POE and POU locations, if daily turbidity of treated water is consistently less than 1.0 NTU;
- Turbidity - daily (leaving the treatment system); and
- Chlorine residual (if applicable) - daily (leaving the treatment system).

Because the water treatment system does not currently provide chlorine disinfection, there is no requirement to monitor chlorine residual in the distribution system. However, if the water treatment system is upgraded with the addition of chlorine disinfection, the chlorine residual should be monitored continuously or daily, which is the requirement for GUDI. If the raw water source becomes a secure groundwater supply, then the chlorine residual monitoring can be reduced to once per month. The same monitoring requirements would also apply for turbidity. It is noted that for the GUDI category, federal departments may choose to reduce the monitoring frequency for turbidity and chlorine residuals, if they are satisfied that they have in place adequate strategies to ensure health protection.

If the option of only retaining UV disinfection is considered to supply water to the sinks, toilets and showers (without primary chlorine disinfection), a stringent and frequent monitoring program would be required, in addition to maintaining the bottled water system as the primary potable water supply. The monitoring frequency for a UV disinfection system without chlorine would include at a minimum, weekly sampling of the POE and POU locations for total coliforms and E.coli during periods of runoff (spring) and bi-monthly sampling during the remainder of the year. This also assumes upgrading the UV system to be Certified NSF Standard 55 Class A.

5.5 RISK-BASED EVALUATION TOOL FOR POTABLE WATER MANAGEMENT

The risk-based evaluation tool for potable water management was completed for the Wild Horse Border Crossing Facility, using information gathered during this Site-Specific Potable Water Risk Assessment. The results are provided in Appendix H. The previous rating given to the Wild Horse Border Crossing Facility was 5 flags, with corrective action recommended. The updated rating, based on the 2012 assessment, is 5 flags, with corrective action recommended.

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The rating was derived as follows:

- Drinking water flag - although the Wild Horse Border Crossing Facility uses bottled water and is not using the well or water treatment system to provide potable water, a flag was assigned, as it is still possible that visitors or staff could be exposed to potential pathogens or viruses through hand washing or accidental ingestion;
- Treatment flag - a flag was assigned since the water source treatment system does not have adequate disinfection capability for the inactivation of pathogens and viruses;
- Exceedance flag - a flag was assigned since there is a history of exceedances for the health-based parameters, total coliforms and *E.coli*, in the raw water source, although the last available results from February and August 2012 and January 2013 did not report any coliforms;
- Post exceedance treatment flag - a flag was assigned since the recent water quality data indicated an exceedance of health-based parameters, total coliforms and *E.coli*, in a POU sample; and
- Health related parameter flag - a flag was assigned since the exceedances for total coliforms and *E.coli* are health related parameters.

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6.0 CLOSURE

This report has been prepared by EGE for the exclusive use of PWGSC and CBSA (the Client) for the specific application described in Section 1.0. The information and data contained herein are to be treated as confidential and are intended for the sole use of the client, and may not be relied upon by any other persons or entity without the express written consent of EGE and the Client.

Any use of this report by a third party, or any reliance on decisions made based on it, are the responsibility of such third parties. EGE does not accept any responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

The work has been conducted in accordance with generally accepted environmental engineering practices. Although every effort has been made to confirm that the information and data presented, including without limitation the results of any sampling and analyses conducted by EGE, is factual, complete and accurate, EGE makes no guarantees or warranties whatsoever, whether expressed or implied, with respect to such information or data.

The findings presented in this report are based on the conditions which existed on site at the time of the work, in the area of the work and in respect of the environmental media which were assessed. The Client, and any other parties using this report with the express written consent of the Client and EGE, should acknowledge that conditions affecting the site can vary with time, may vary in other areas of the site and that other media other than those described herein could be present on site. EGE cannot warrant against undiscovered environmental liabilities.

Should additional environmental information become available in the area of concern or in other areas of the site, EGE requests that this information be brought to our attention so that we may re-evaluate the findings and conclusions of this report.

Respectively Submitted,

EGE ENGINEERING LTD.

David Klassen, P.Geo.
 Environmental Geoscientist

Peter Bohonos, P.Eng.
 Project Engineer

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7.0 REFERENCES

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15. Earth Tech (Canada) Inc. 2005-06 National Potable Water Monitoring Program CBSA Ports of Entry and Residences, October 2005 Water Sampling Event, December 2005.

FIGURES

APPENDIX A HEALTH AND SAFETY PLAN

APPENDIX B SITE PHOTOGRAPHS

APPENDIX C WATER WELL RECORDS

APPENDIX D
MAINTENANCE RECORDS

APPENDIX E
ON-SITE EQUIPMENT MANUAL

APPENDIX F
SITE DOCUMENTATION OBTAINED DURING THE ASSESSMENT

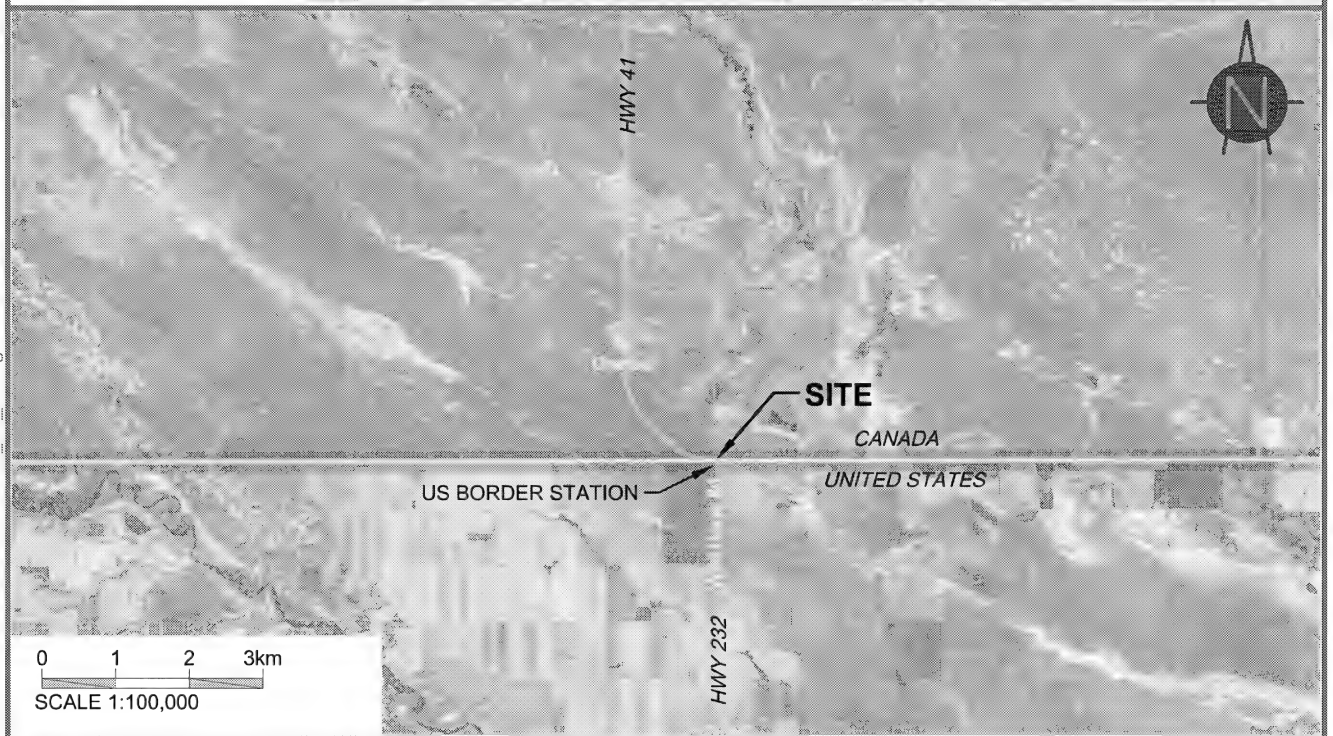
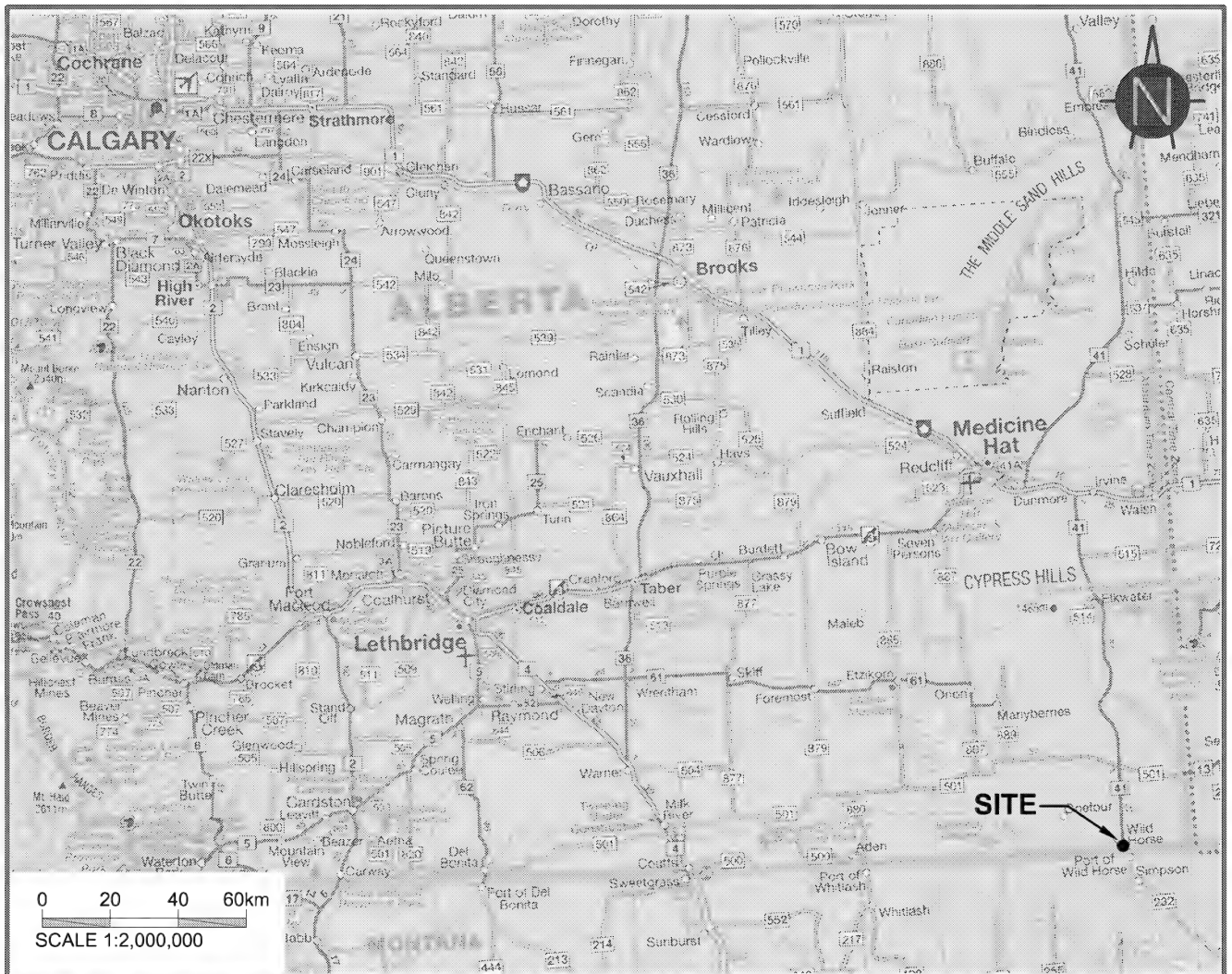
APPENDIX G
CBSA ASSESSMENT CHECKLIST

APPENDIX H
CBSA FACILITY MANAGEMENT DATABASE RECORD UPDATE

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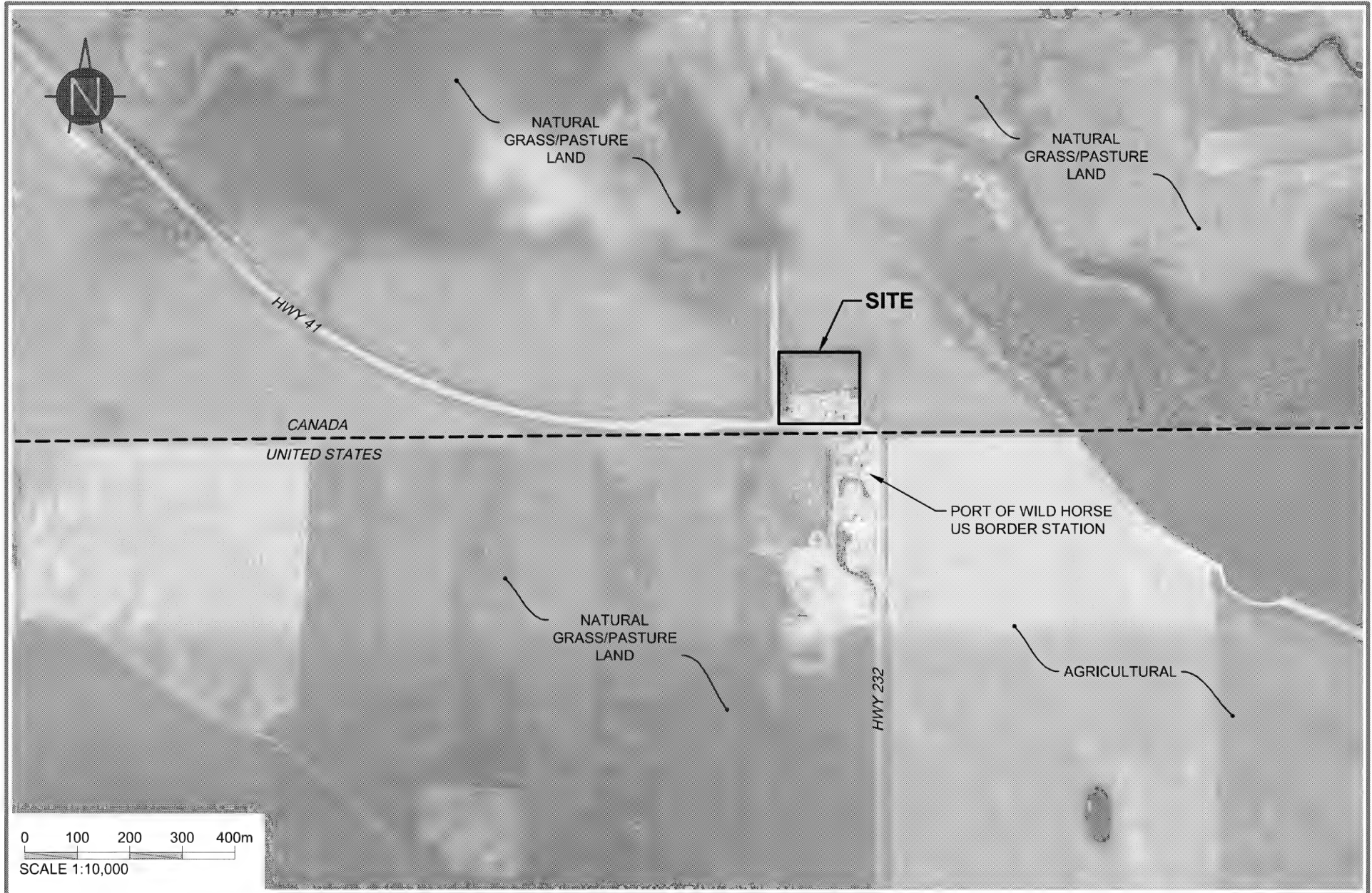


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Location
Plan

Figure 01

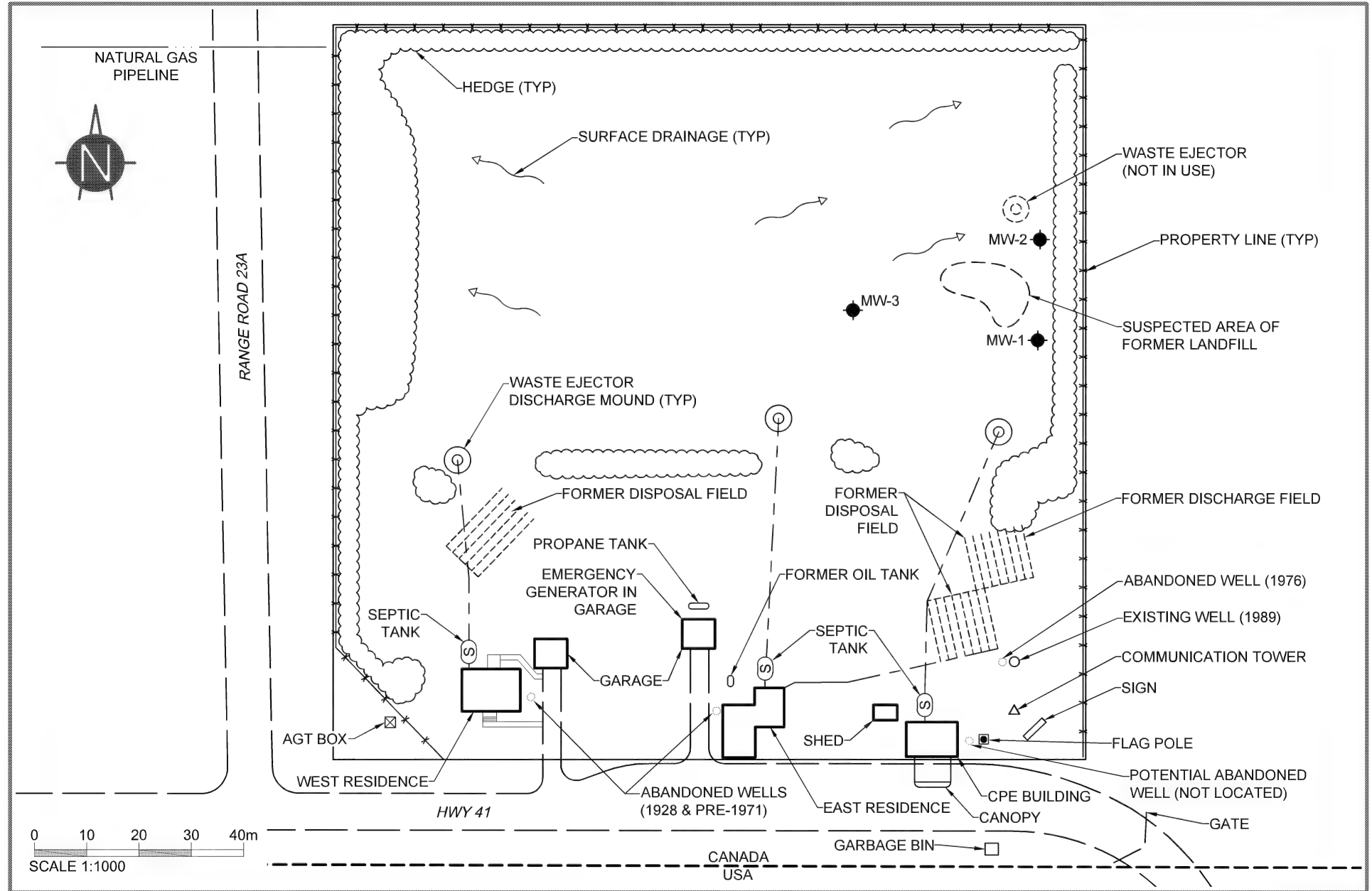


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Surrounding
Land Use

Figure 02

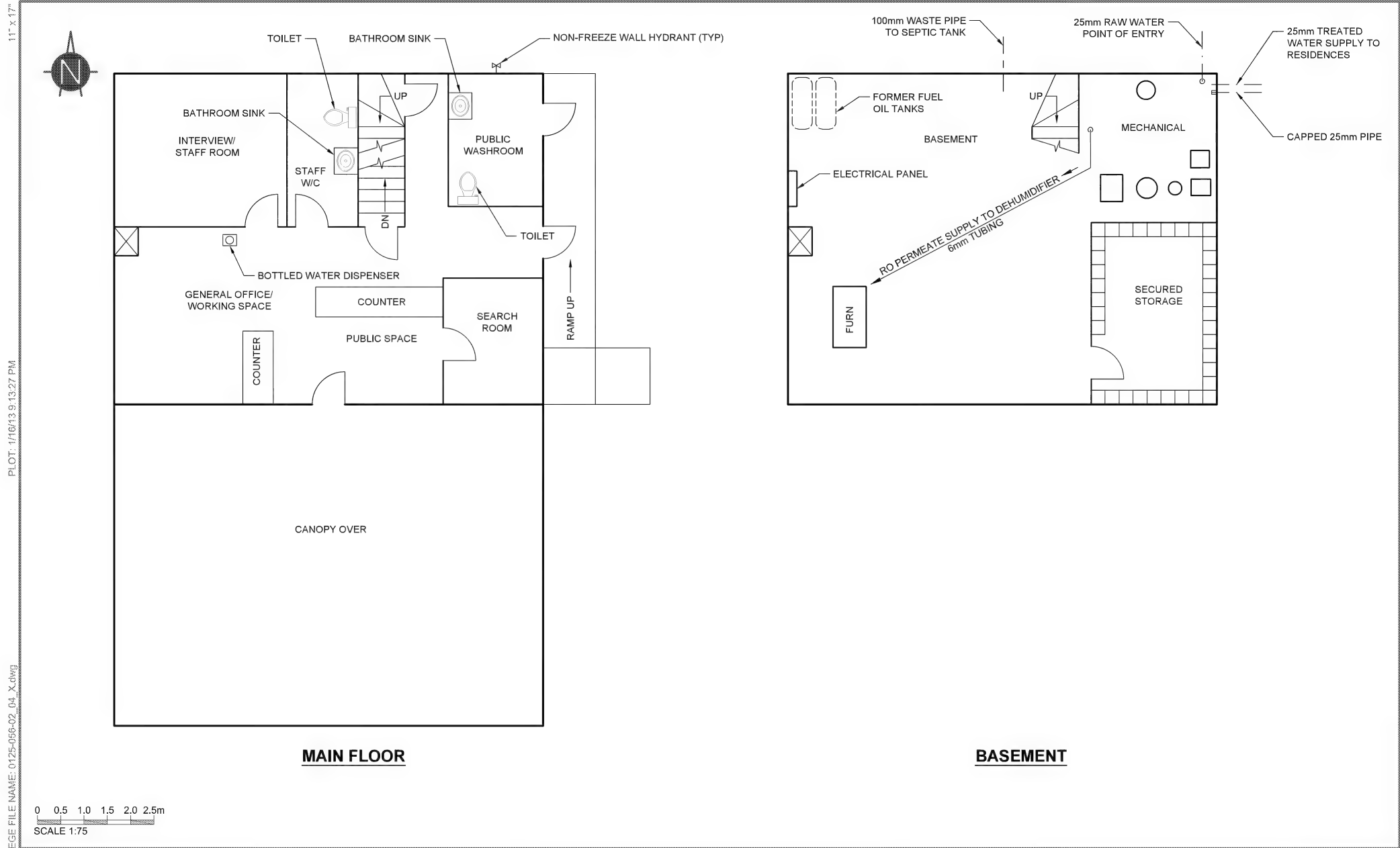


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Site Plan

Figure 03

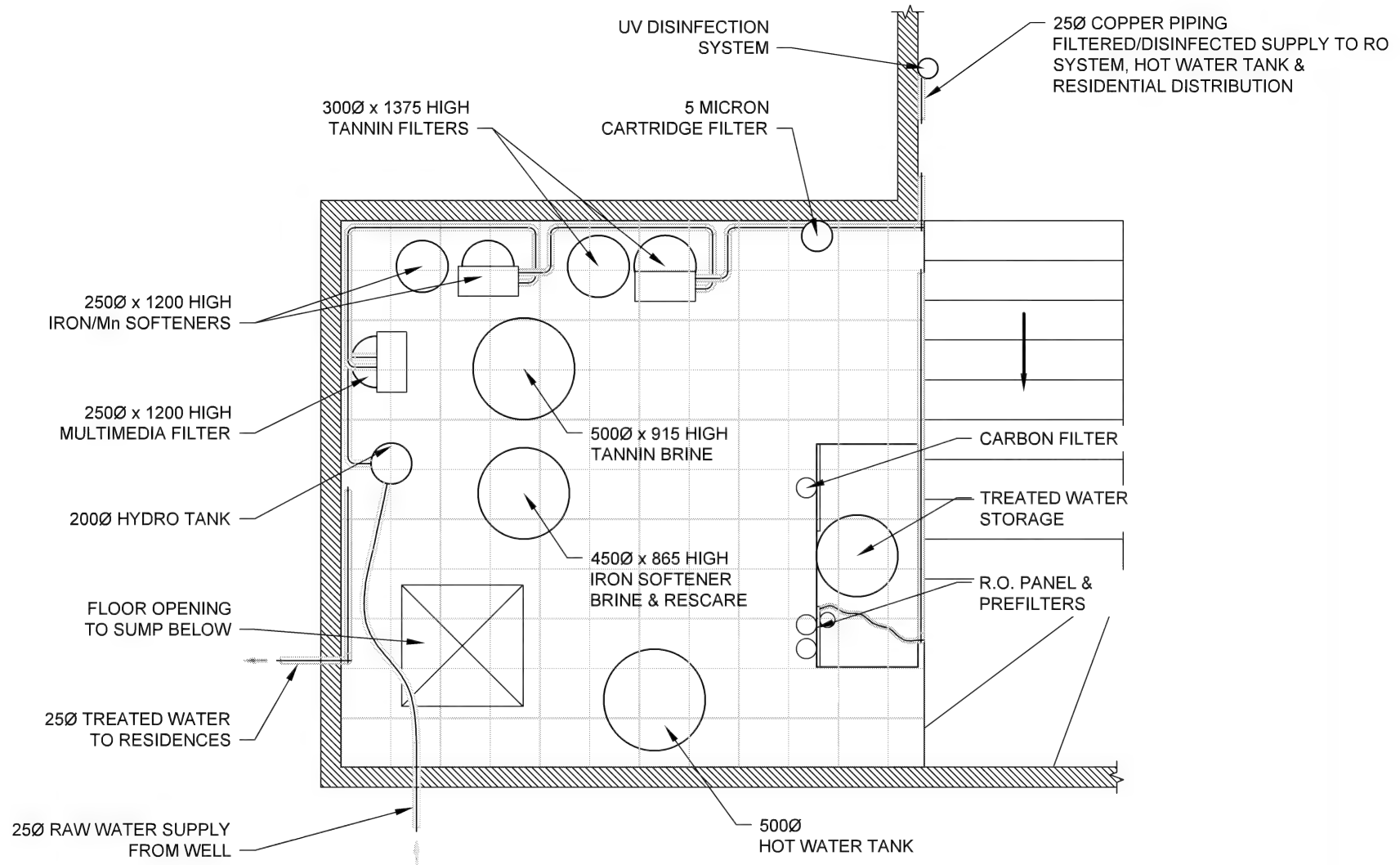


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CPE Building
 Floor Plan

Figure 04

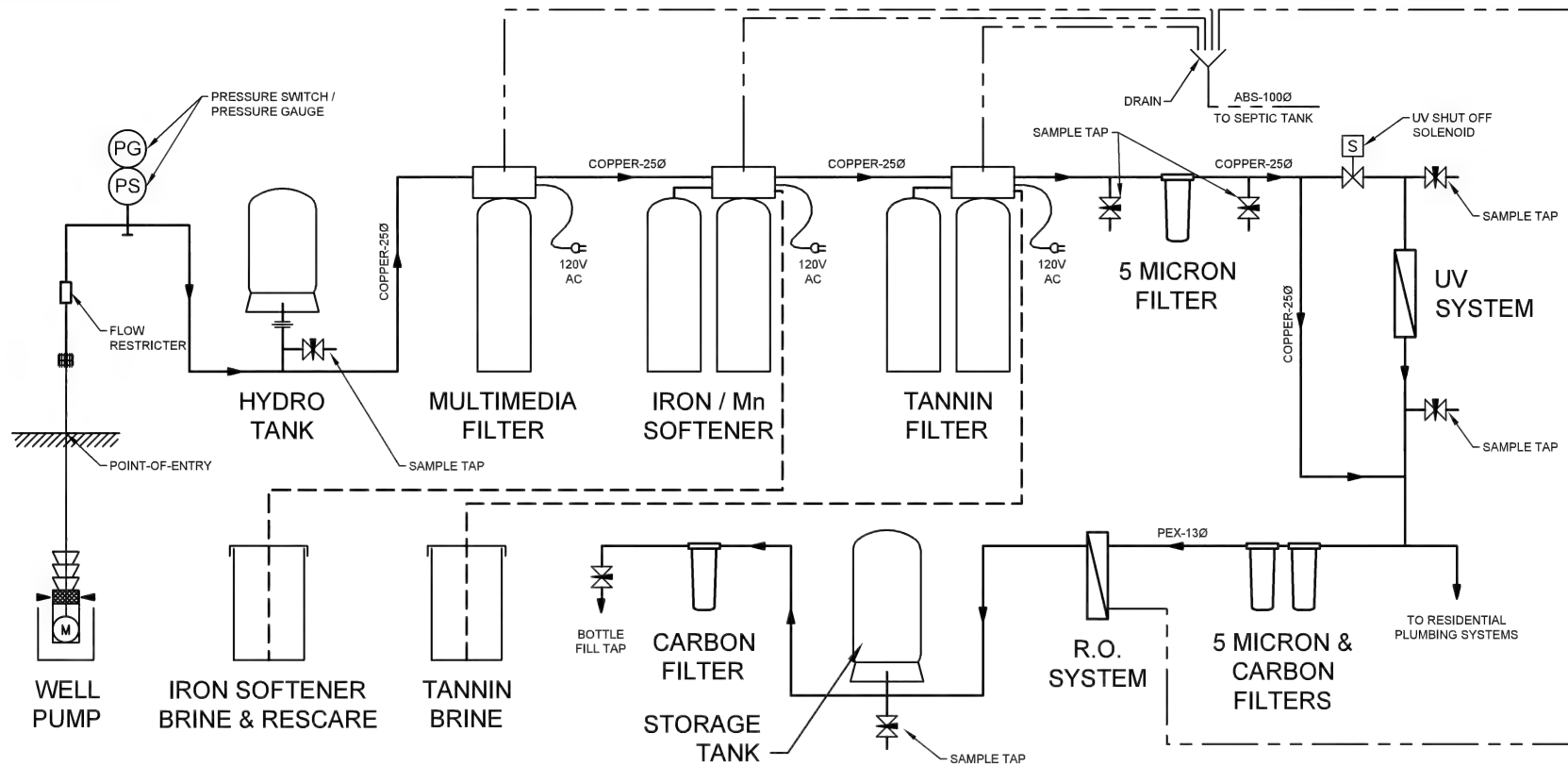


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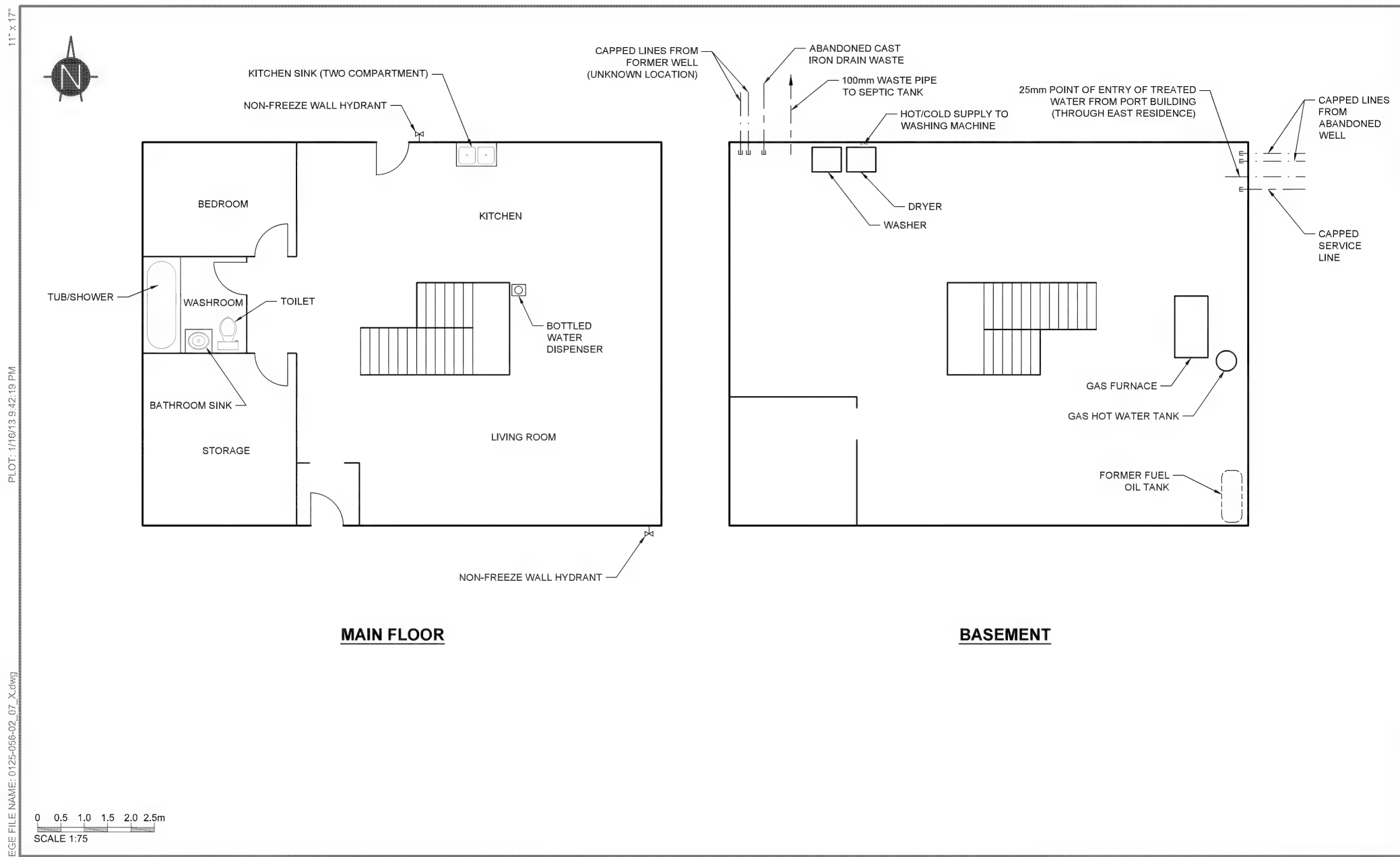
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Water Treatment
 Area

Figure 05



| WELL PUMP | HYDRO TANK | MULTIMEDIA FILTER | IRON GUARD SOFTENER | TANNIN FILTER |
|--------------------------|----------------------------|-----------------------|------------------------|----------------------------|
| TYPE: SUBMERSIBLE | TYPE: HYDRO-PNEUMATIC | TYPE: PRESSURE | TYPE: PRESSURE | TYPE: PRESSURE |
| MANUF: GOULDS | DIM: 200Ø x 300 | DIM: 250Ø x 1200 | DIM: 250Ø x 1200 | DIM: 300Ø x 1350 |
| MAKE: 7LS05412 | MANUF: FLEXCON IND. | MEDIA: SAND?? | MEDIA: RESIN | MEDIA: RESIN |
| SIZE: 100 mm | MODEL: PJR 6 | MANUF: NOVATEK | MANUF: NOVO | MANUF: NOVO |
| CAP.: X.XX L/s @ XXX.X m | MAX PR: 125 PSI | MODEL: NMMF10 | MODEL: CDA-30-1TD-2TX | MODEL: COD-20-75TD-2TS-850 |
| POWER: 0.5 hp | CAP: 8.0 L | VALVE: FLECK 2150 ?? | VALVE: FLECK 3200 ?? | VALVE: FLECK 3200 ?? |
| NOTES: 230V/1φ | | | | |
| UV SYSTEM | R.O. SYSTEM | STORAGE TANK | BRINE TANK | |
| MANUF: STERILIGHT | MANUF: WATERGROUP | TYPE: HYDRO-PNEUMATIC | TYPE: POLYETHYLENE | |
| MODEL: SCM-320 | MODEL: WGR-300 | DIM: 400Ø x 1100 | CAP.: 160 L (45 USGAL) | |
| LAMP: S320RL-HO | ELEMENT: FILMTEC-TW30-2521 | MANUF: PENTAIR | | |
| SLEEVE: QS-320 | MOTOR: 0.33 HP | MODEL: WELL MATE 0120 | | |
| BALLAST: BA ICE-CM | FILTER: SEDIMENT / CARBON | MAX PR: 125 PSI | | |
| | | CAP: 112 L | | |

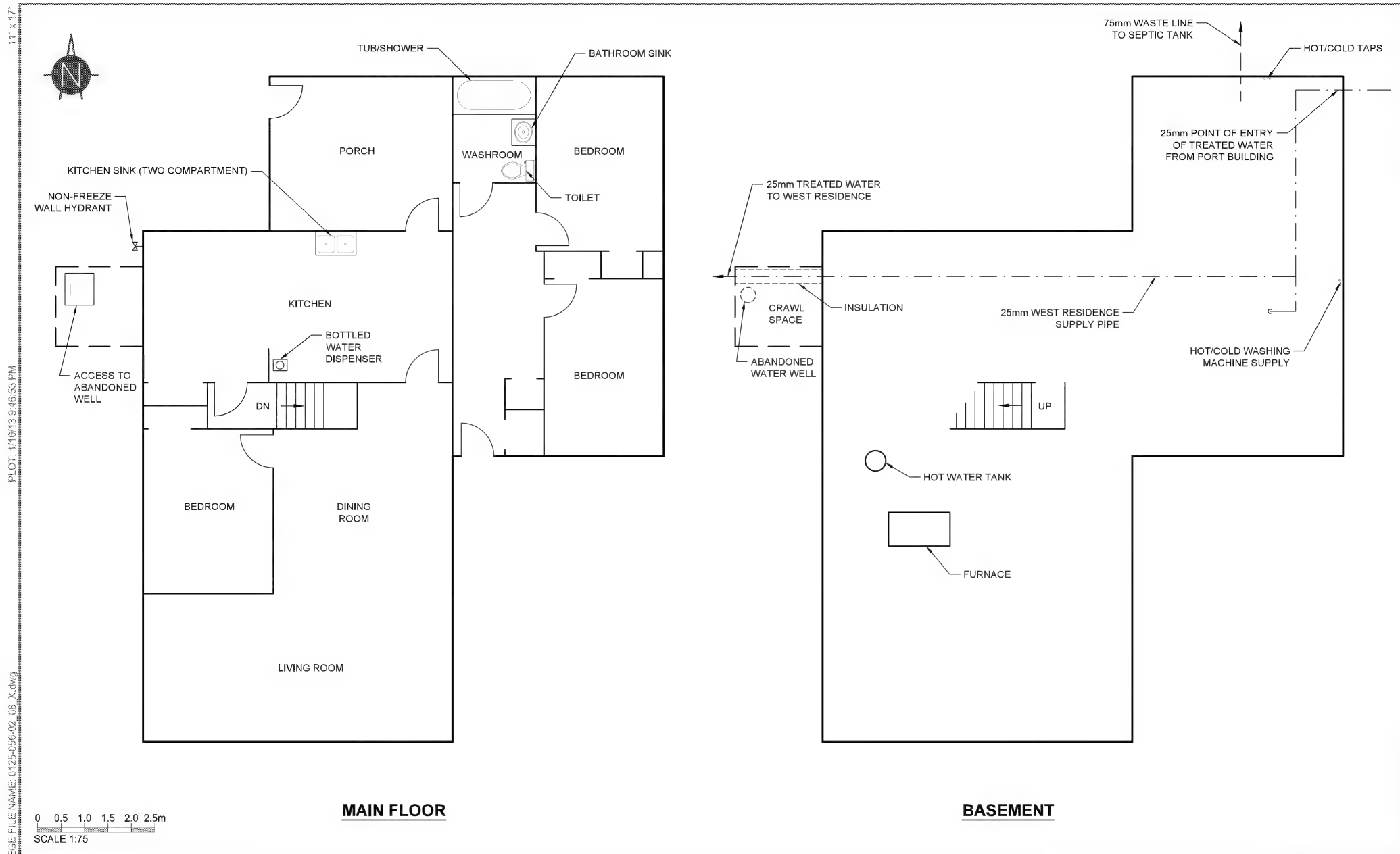


EGE

Public Works & Government Services Canada
 Canada Border Services Agency
 Wild Horse Border Crossing Facility, Alberta
 Site-Specific Potable Water Risk Assessment

West Residence
 Floor Plan

Figure 07



EGE

Public Works & Government Services Canada
 Canada Border Services Agency
 Wild Horse Border Crossing Facility, Alberta
 Site-Specific Potable Water Risk Assessment

East Residence
 Floor Plan

Figure 08

Crupi, Kayla

From: Simonson, Lyle
Sent: February 26, 2015 02:16 PM
To: Michael, Connie; Proudfoot, Hayley
Subject: RE: Question: water at Wild Horse POE

No need to sample in the houses. Sampling the trailer is sufficient.

Thanks,

Lyle Simonson

Facility Officer / Operations Branch
Canada Border Services Agency
Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Cel:306-502-6428 / TTY:1-866-335-3237

Agent des installations / Direction générale des opérations
Agence des services frontaliers du Canada
Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Tél. cell.:306-502-6428 / ATS:1-866-335-3237

From: Michael, Connie
Sent: February 26, 2015 12:18 PM
To: Simonson, Lyle; Proudfoot, Hayley
Subject: FW: Question: water at Wild Horse POE

Hi Lyle – Please give us your comments on this? I would like to hold off on the houses but I respect your opinion.

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch
Canada Border Services Agency / Government of Canada
Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

Gestionnaire de l'infrastructure, Direction générale des opérations
Agence des services frontaliers du Canada / Gouvernement du Canada
Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

From: Proudfoot, Hayley
Sent: February 26, 2015 12:11 PM
To: Michael, Connie
Subject: Question: water at Wild Horse POE

Hi Connie,

After water sampling was last conducted in January 2015 at the Wild Horse port of entry, the consultant, Robert Till from SLR Consulting, made a recommendation. He suggests no longer sampling at the residences as they are no longer occupied, and instead sampling inside the ATCO trailer. Do you feel this makes sense? Will the houses soon be occupied – therefore should we continue to sample there to continue observing water quality inside the residences? Or will they continue to be empty? Do you feel the ATCO trailer needs to be sampled?

Thanks for your help and time,
Hayley

Hayley Proudfoot
Environmental Analyst | Analyste de l'environnement
Environmental Programs Division | Division des programmes environnementaux
Canada Border Services Agency | Agence des services frontaliers du Canada
333 North River Road, Tower A, 18th Floor, Room 18034 | 333 chemin North River, tours A, 18^e étage, 18034
Ottawa, ON K1A 0L8

Telephone: (343) 291-5834
Blackberry: (613) 866-7144
Email : Hayley.Proudfoot@cbsa-asfc.gc.ca

From: Robert Till [[mailto: @slrconsulting.com](mailto:@slrconsulting.com)]
Sent: February 26, 2015 12:50 PM
To: Morris, Martine
Subject: RE: CBSA Potable Water: Wild Horse

Hi Martine,

Before I make the final recommendations on this I would like to speak to the site staff to make sure we are recommending the best course of action for them, and to make sure we are not going to stop the sampling at the houses if for any reason water is still being used there. Please would you be able to provide me with the phone number of the office there so I can call?

Many thanks in advance,

Robert

From: Morris, Martine [<mailto:Martine.Morris@cbsa-asfc.gc.ca>]
Sent: February 26, 2015 7:04 AM
To: Robert Till
Cc: Proudfoot, Hayley
Subject: FW: CBSA Potable Water: Wild Horse

Good morning Robert~

Hope you are doing well.

Would it be possible to send us the report for this sampling result in PDF format?

Also, following your suggestion to sample at the ATCO trailer in April instead of the residences, can you please advise if the Sample Point Location in the trailer will be the kitchen or bathroom location? Or both?

Thank you,

Martine Morris

Environmental Operations | Opérations environnementales
Canada Border Services Agency | Agence des services frontaliers du Canada
333 North River Road, 18th Floor | 333, rue North River, 18^e étage
Ottawa, ON K1A 0L8

Telephone | Téléphone 343-291-5833

From: Robert Till [[mailto: @slrconsulting.com](mailto:@slrconsulting.com)]
Sent: February 2, 2015 11:55 AM

To: Proudfoot, Hayley

Cc: Brownlee, Michael: PWGSC / TPSGC; Stang, Erin: PWGSC / TPSGC; Gariano, Anthony: PWGSC / TPSGC

Subject: January 2015 CBSA Wild Horse Potable Water Sampling - Aesthetic Objective Exceedences Only

Hi Hayley,

Complete analytical results for the January 2015 monitoring round at Wild Horse border crossing came in on Wednesday (attached) and indicated that no parameters exceeded their maximum allowable concentrations (MAC), however all samples exceeded their aesthetic objectives (AO) for total dissolved solids, chloride and sodium. pH in the eastern residence and dissolved sulphate in both residences also exceeded the aesthetic objectives. The results were as follows with the exceedences (if present) highlighted in red:

| Sample Location | WILDHORSE_OFF_POE | WILDHORSE_OFF_KTC | WILDHORSE_OFF_RES-E-KTC | WILDHORSE_OFF_RES-W-KTC |
|-----------------------------------|-------------------|-------------------|-------------------------|-------------------------|
| Total Dissolved Solids (mg/L) | 2900 | 2800 | 3000 | |
| pH | 7.62 | 7.61 | 8.98 | |
| Total Cadmium (ug/L) | <0.020 | <0.020 | <0.020 | |
| Alkalinity (Total as CaCO3)(mg/L) | 37 | 54 | 320 | |
| Bicarbonate (mg/L) | 45 | 66 | 330 | |
| Carbonate (mg/L) | <0.50 | <0.50 | 28 | |
| Hydroxide (mg/L) | <0.50 | <0.50 | <0.50 | |
| Dissolved Sulphate (mg/L) | 6.3 | 3.6 | 1100 | |
| Dissolved Chloride (mg/L) | 1900 | 1800 | 660 | |
| E.Coli DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | |
| Total Coliforms DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | |
| Turbidity | 0.67 | 0.68 | 0.36 | |
| Total Aluminum (mg/L) | <0.0030 | <0.0030 | 0.0053 | |
| Total Antimony (mg/L) | <0.00060 | <0.00060 | <0.00060 | |
| Total Arsenic (mg/L) | <0.00020 | <0.00020 | 0.00025 | |
| Total Barium (mg/L) | <0.010 | <0.010 | <0.010 | |
| Total Boron (mg/L) | 0.84 | 0.84 | 0.84 | |
| Total Calcium (mg/L) | 0.42 | 0.45 | <0.30 | |
| Total Chromium (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Copper (mg/L) | 0.0036 | 0.0095 | 0.037 | |
| Total Iron (mg/L) | <0.060 | <0.060 | <0.060 | |
| Total Lead (mg/L) | <0.00020 | 0.00038 | 0.00051 | |
| Total Lithium (mg/L) | 0.13 | 0.046 | 0.16 | |
| Total Magnesium (mg/L) | <0.20 | <0.20 | <0.20 | |
| Total Manganese(mg/L) | <0.0040 | <0.0040 | <0.0040 | |
| Total Phosphorus (mg/L) | <0.10 | <0.10 | <0.10 | |
| Total Potassium (mg/L) | 1.8 | 1.4 | 1.6 | |
| Total Selenium (mg/L) | <0.00020 | 0.00021 | 0.0004 | |
| Total Silicon (mg/L) | 2.9 | 3 | 2.4 | |
| Total Sodium (mg/L) | 1100 | 1100 | 1100 | |
| Total Strontium (mg/L) | <0.020 | <0.020 | <0.020 | |
| Total Sulphur (mg/L) | <0.20 | <0.20 | 350 | |
| Total Titanium (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Uranium (mg/L) | <0.00010 | <0.00010 | 0.00015 | |
| Total Zinc (mg/L) | 0.0048 | 0.02 | 0.012 | |
| Total Mercury (ug/L) | <0.0020 | <0.0020 | <0.0020 | |

The exceedence of aesthetic objectives and operational guidance guidelines do not pose a health risk to site personnel, however they may affect the taste and odour of the water at the site which may prevent personnel consuming the water. It was indicated that bottled water is currently being used for drinking and food preparation at the site. As sodium could be a potential health issue for people on low-sodium diets, it is recommended that signage be put up to warn them of the issue. The high concentrations of both sodium and chloride could potentially indicate a salt source such as road salt which may be preventable. No obvious sources were observed on site. There were several further issues of note:

- Site personnel noted that the bottled water cooler had not been cleaned for several months as the site staff were not aware of how to clean it. It is recommended that the cooler be professionally cleaned, and/or training is provided for site staff to enable cleaning of the cooler on a regular basis.
- It is noted that water quality has changed at the sampling points within the residences, with increases in sulphate (now above guidelines) and sulphur and a drop in chloride. It was noted by site personnel that the residences had been condemned and were seldom used, with staff residing in an ATCO trailer now on site. With this in mind, it is suggested that the residence sample points 2D416 (residence east) and 2D417 (residence west) be dropped from the April sampling, and replaced by the point of use within the ATCO trailer (if present) and at the office water cooler if cleaning can't be arranged.

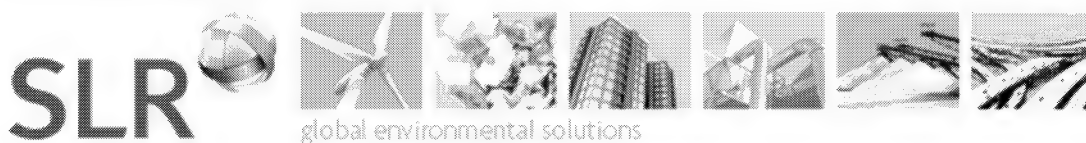
Kind regards,

Robert

Robert Till, M.Sc., P.Geo, FGS
Senior Hydrogeologist
SLR Consulting (Canada) Ltd.

Cell:
Office: 780-490-7893
Fax: 780-490-7819
Email: @slrconsulting.com
6940 Roper Road, Edmonton, AB, T6B 3H9, Canada

www.slrconsulting.com



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Crupi, Kayla

From: Morris, Martine
Sent: March 5, 2015 09:55 AM
To: 'Robert Till'
Cc: Proudfoot, Hayley
Subject: RE: CBSA Potable Water: Wild Horse
Attachments: WHTrailerKTC.pdf; WHTrailerWASLeft.pdf; WHTrailerWASRight.pdf

Hi Robert~

Good idea about labelling the washrooms left and right. From what I understand, there are four sleeping units, two bathrooms and a common living area in the trailer. I also don't know the layout of the trailer and whether or not the bathrooms are gender related, so let's stick with your idea of left and right for now. We can amend this in the future if need be.

I've made changes to the SPLs and have attached the PDF formats for the labels.

If you have any questions, please let me know.

Martine

From: Robert Till [mailto: @slrconsulting.com]
Sent: March 3, 2015 10:41 AM
To: Morris, Martine
Cc: Proudfoot, Hayley
Subject: RE: CBSA Potable Water: Wild Horse

Hi Martine,

Our sampler did not visit the trailer when he was there and so does not know the orientation of the washrooms or layout of the trailer. My thoughts are that it would depend on the internal trailer layout and so be "WAS LEFT" and "WAS RIGHT", I think this way would be better than east / west etc., as the trailer could potentially be moved between sampling rounds and the compass orientation change; however the internal layout would not. The gender of the washrooms could also be used if there is one male and one female washroom, but again, I don't know the layout so can't say whether this would be appropriate.

Kind regards,

Robert

Robert Till, M.Sc., P.Geo, FGS
Senior Hydrogeologist
SLR Consulting (Canada) Ltd.

Cell:
Office: 780-490-7893
Fax: 780-490-7819
Email: [@slrconsulting.com](mailto: @slrconsulting.com)
6940 Roper Road, Edmonton, AB, T6B 3H9, Canada

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From: Morris, Martine [<mailto:Martine.Morris@cbsa-asfc.gc.ca>]

Sent: February 27, 2015 6:43 AM

To: Robert Till

Cc: Proudfoot, Hayley

Subject: RE: CBSA Potable Water: Wild Horse

Good morning Robert~

Following your recommendations to stop sampling at the residences because they are condemned and vacant, Hayley has spoken with our colleagues in the Prairie Region and it has been decided that sampling at these two locations will discontinue.

The ATCO trailer has a kitchen and two washrooms. We would like to sample at all three of these locations and I've created three new SPLs in Watertrax for the ATCO trailer:

ATCO TRAILER-KTC

ATCO TRAILER-WAS 1

ATCO TRAILER-WAS 2

The labels for these are attached. My only concern is how we will differentiate from WAS 1 and WAS 2 in all future samplings. It is undecided yet if the ATCO trailer will become a permanent fixture at the port, as it is slated for replacement in the next fiscal year.

Would you have any suggestions? I can easily make any changes in WT.

Thank you for all your help!

Martine Morris

Environmental Operations | Opérations environnementales
Canada Border Services Agency | Agence des services frontaliers du Canada
333 North River Road, 18th Floor | 333, rue North River, 18e étage
Ottawa, ON K1A 0L8

Telephone | Téléphone 343-291-5833

From: Robert Till [<mailto:@slrconsulting.com>]

Sent: February 26, 2015 1:35 PM

To: Morris, Martine

Cc: Proudfoot, Hayley

Subject: RE: CBSA Potable Water: Wild Horse

Hi Martine,

No problem. Please find the requested pdf attached.

Kind regards,

Robert

From: Morris, Martine [<mailto:Martine.Morris@cbsa-asfc.gc.ca>]
Sent: February 26, 2015 11:29 AM
To: Robert Till
Cc: Proudfoot, Hayley
Subject: RE: CBSA Potable Water: Wild Horse

Hi Robert~

I forwarded your email to Hayley and she will contact the Region to further discuss what will be happening with the residences. We will let you know prior to the April sampling round how we will proceed.

In the meantime, could you please forward the PDF format of this sample result?

Thank you kindly,

Martine Morris

Environmental Operations | Opérations environnementales
Canada Border Services Agency | Agence des services frontaliers du Canada
333 North River Road, 18th Floor | 333, rue North River, 18e étage
Ottawa, ON K1A 0L8

Telephone | Téléphone 343-291-5833

From: Robert Till [@slrconsulting.com]
Sent: February 26, 2015 12:50 PM
To: Morris, Martine
Subject: RE: CBSA Potable Water: Wild Horse

Hi Martine,

Before I make the final recommendations on this I would like to speak to the site staff to make sure we are recommending the best course of action for them, and to make sure we are not going to stop the sampling at the houses if for any reason water is still being used there. Please would you be able to provide me with the phone number of the office there so I can call?

Many thanks in advance,

Robert

From: Morris, Martine [<mailto:Martine.Morris@cbsa-asfc.gc.ca>]
Sent: February 26, 2015 7:04 AM
To: Robert Till
Cc: Proudfoot, Hayley
Subject: FW: CBSA Potable Water: Wild Horse

Good morning Robert~

Hope you are doing well.

Would it be possible to send us the report for this sampling result in PDF format?

Also, following your suggestion to sample at the ATCO trailer in April instead of the residences, can you please advise if the Sample Point Location in the trailer will be the kitchen or bathroom location? Or both?

Thank you,

Martine Morris

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 Ottawa, ON K1A 0L8

Telephone | Téléphone 343-291-5833

From: Robert Till [mailto: @slrconsulting.com]

Sent: February 2, 2015 11:55 AM

To: Proudfoot, Hayley

Cc: Brownlee, Michael: PWGSC / TPSGC; Stang, Erin: PWGSC / TPSGC; Gariano, Anthony: PWGSC / TPSGC

Subject: January 2015 CBSA Wild Horse Potable Water Sampling - Aesthetic Objective Exceedences Only

Hi Hayley,

Complete analytical results for the January 2015 monitoring round at Wild Horse border crossing came in on Wednesday (attached) and indicated that no parameters exceeded their maximum allowable concentrations (MAC), however all samples exceeded their aesthetic objectives (AO) for total dissolved solids, chloride and sodium. pH in the eastern residence and dissolved sulphate in both residences also exceeded the aesthetic objectives. The results were as follows with the exceedances (if present) highlighted in red:

| Sample Location | WILDHORSE_OFF_POE | WILDHORSE_OFF_KTC | WILDHORSE_OFF_RES-E-KTC | WILDHORSE_OFF_W-KTC |
|-----------------------------------|-------------------|-------------------|-------------------------|---------------------|
| Total Dissolved Solids (mg/L) | 2900 | 2800 | 3000 | |
| pH | 7.62 | 7.61 | 8.98 | |
| Total Cadmium (ug/L) | <0.020 | <0.020 | <0.020 | |
| Alkalinity (Total as CaCO3)(mg/L) | 37 | 54 | 320 | |
| Bicarbonate (mg/L) | 45 | 66 | 330 | |
| Carbonate (mg/L) | <0.50 | <0.50 | 28 | |
| Hydroxide (mg/L) | <0.50 | <0.50 | <0.50 | |
| Dissolved Sulphate (mg/L) | 6.3 | 3.6 | 1100 | |
| Dissolved Chloride (mg/L) | 1900 | 1800 | 660 | |
| E.Coli DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | |
| Total Coliforms DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | |
| Turbidity | 0.67 | 0.68 | 0.36 | |
| Total Aluminum (mg/L) | <0.0030 | <0.0030 | 0.0053 | |
| Total Antimony (mg/L) | <0.00060 | <0.00060 | <0.00060 | |
| Total Arsenic (mg/L) | <0.00020 | <0.00020 | 0.00025 | |
| Total Barium (mg/L) | <0.010 | <0.010 | <0.010 | |
| Total Boron (mg/L) | 0.84 | 0.84 | 0.84 | |
| Total Calcium (mg/L) | 0.42 | 0.45 | <0.30 | |
| Total Chromium (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Copper (mg/L) | 0.0036 | 0.0095 | 0.037 | |
| Total Iron (mg/L) | <0.060 | <0.060 | <0.060 | |
| Total Lead (mg/L) | <0.00020 | 0.00038 | 0.00051 | |
| Total Lithium (mg/L) | 0.13 | 0.046 | 0.16 | |
| Total Magnesium (mg/L) | <0.20 | <0.20 | <0.20 | |
| Total Manganese(mg/L) | <0.0040 | <0.0040 | <0.0040 | |
| Total Phosphorus (mg/L) | <0.10 | <0.10 | <0.10 | |
| Total Potassium (mg/L) | 1.8 | 1.4 | 1.6 | |

| | | | | |
|------------------------|-------------|-------------|-------------|--|
| Total Selenium (mg/L) | <0.00020 | 0.00021 | 0.0004 | |
| Total Silicon (mg/L) | 2.9 | 3 | 2.4 | |
| Total Sodium (mg/L) | 1100 | 1100 | 1100 | |
| Total Strontium (mg/L) | <0.020 | <0.020 | <0.020 | |
| Total Sulphur (mg/L) | <0.20 | <0.20 | 350 | |
| Total Titanium (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Uranium (mg/L) | <0.00010 | <0.00010 | 0.00015 | |
| Total Zinc (mg/L) | 0.0048 | 0.02 | 0.012 | |
| Total Mercury (ug/L) | <0.0020 | <0.0020 | <0.0020 | |

The exceedence of aesthetic objectives and operational guidance guidelines do not pose a health risk to site personnel, however they may affect the taste and odour of the water at the site which may prevent personnel consuming the water. It was indicated that bottled water is currently being used for drinking and food preparation at the site. As sodium could be a potential health issue for people on low-sodium diets, it is recommended that signage be put up to warn them of the issue. The high concentrations of both sodium and chloride could potentially indicate a salt source such as road salt which may be preventable. No obvious sources were observed on site. There were several further issues of note:

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- It is noted that water quality has changed at the sampling points within the residences, with increases in sulphate (now above guidelines) and sulphur and a drop in chloride. It was noted by site personnel that the residences had been condemned and were seldom used, with staff residing in an ATCO trailer now on site. With this in mind, it is suggested that the residence sample points 2D416 (residence east) and 2D417 (residence west) be dropped from the April sampling, and replaced by the point of use within the ATCO trailer (if present) and at the office water cooler if cleaning can't be arranged.

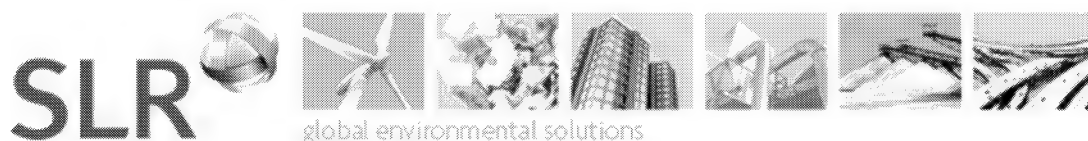
Kind regards,

Robert

Robert Till, M.Sc., P.Geo, FGS
 Senior Hydrogeologist
 SLR Consulting (Canada) Ltd.

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Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-KTC

WTX Client ID: 16673
Sampling Point Locator: 31FCD



16673-031FCD

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

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CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
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16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS LEFT

WTX Client ID: 16673
Sampling Point Locator: 31FCE



16673-031FCE

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Laboratory: Please Report this Test Result to WaterTrax.

CBSA / ASFC > Prairie Region > Alberta > Wild Horse > Wild Horse - Drilled Well > ATCO Trailer

Sampling Point: WILD HORSE-ATCO TRAILER-WAS RIGHT

WTX Client ID: 16673
Sampling Point Locator: 31FCF



16673-031FCF

Crupi, Kayla

From: Bowman, Stephan
Sent: June 25, 2015 01:01 PM
To: Proudfoot, Hayley
Subject: RE: Wildhorse well

Go Lyle!

From: Proudfoot, Hayley
Sent: June 25, 2015 12:55 PM
To: Bowman, Stephan; Morris, Martine
Subject: FW: Wildhorse well

FYI

From: Simonson, Lyle
Sent: June 25, 2015 12:19 PM
To: Proudfoot, Hayley
Subject: Re: Wildhorse well

No we would put it on canadian side. Wildhorse is contaminated from years of septic pump out. We want to drill off government property. Pwgscc advised trying to procure land to do this from private landowners can be a time consuming and sometimes expensive proposition. Drilling in no mans land costs nothing and only requires boundary commission approval. The well at Del Bonita was done this way years ago.

Sent from my BlackBerry handheld.
Envoyé à partir de mon BlackBerry.

From: Proudfoot, Hayley
Sent: Thursday, June 25, 2015 10:13 AM
To: Simonson, Lyle
Subject: RE: Wildhorse well

Hi Lyle,

Checked with the group here and no one has experience working with boundary commission. Are you having to go through them because the well is located on the US side?

Thanks for the update,
Hayley

From: Simonson, Lyle
Sent: June 25, 2015 11:41 AM
To: Proudfoot, Hayley
Subject: Re: Wildhorse well

Working on it. Going to have to discuss with boundary commission about putting it in no mans land. Do you have any experience working with them?

Sent from my BlackBerry handheld.

Crupi, Kayla

From: Michael, Connie
Sent: August 6, 2015 03:32 PM
To: Marsden, Kelly
Cc: Proudfoot, Hayley; Simonson, Lyle
Subject: FW: Wildhorse well

Hi Kelly – Is this enough justification for CBSA to do the work. It can be a Health and Safety issue. Also it is costly to truck water into this location.

Let me know if you require anything further. It is mostly the timeframes as the work cannot be done by BGIS this fiscal year.

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch
Canada Border Services Agency / Government of Canada
Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

Gestionnaire de l'infrastructure, Direction générale des opérations
Agence des services frontaliers du Canada / Gouvernement du Canada
Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

From: Simonson, Lyle
Sent: August 6, 2015 10:31 AM
To: Michael, Connie
Subject: RE: Wildhorse well

Put it this way:

Theoretically the contractors used will be the same and cost the same whether I manage the project or Brookfield manages the project.

Brookfield will have consultant and project fees which I won't have. Only additional costs I will have is travel to Wildhorse. Just going on that alone I can do it cheaper. However, cost savings is not the driving factor in doing the work ourselves. This well is needed as the current one is failing and could quit at any time. If it quits on us we are in trouble. We have no cistern to store water. The closest source to haul water is an hour trip one way. So if the well goes out we have to buy a storage tank and pay to haul water. It will be at least \$500 per load to haul it in. Costs to provide water if the well fails will get very expensive very quickly.

Brookfield has advised that they will not be able to complete this project this fiscal year. They are currently working on getting a price for us. I have no idea how long that will take. It's not that they can't do it but being as there is lots of growing pains it has taken us awhile to reach this point. I know I can complete the project before the end of October. I think we need to get this done ASAP as they are experiencing further problems with the water as can be witnessed by the NSCC notifications.

Thanks,

Lyle Simonson

Facility Officer / Operations Branch
Canada Border Services Agency

Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Cel:306-502-6428 / TTY:1-866-335-3237

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Agence des services frontaliers du Canada

Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Tél. cell.:306-502-6428 / ATS:1-866-335-3237

From: Michael, Connie
Sent: August 6, 2015 8:52 AM
To: Marsden, Kelly
Cc: Simonson, Lyle
Subject: RE: Wildhorse well

Hi Kelly – I will have Lyle start on this as soon as possible.

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch

Canada Border Services Agency / Government of Canada

Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

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Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

From: Marsden, Kelly
Sent: August 6, 2015 9:51 AM
To: Michael, Connie
Subject: FW: Wildhorse well

Hi Connie :

Can you please provide me with the quote back from BGIS and the quote with Lyle undertaking the work independently. We need proof for PW to manage the quality assurance/quality management components of this contract.

Thanks,

K

From: Proudfoot, Hayley
Sent: August 6, 2015 10:40 AM
To: Marsden, Kelly
Subject: Fw: Wildhorse well

Sent from my BlackBerry 10 smartphone.

From: Michael, Connie <Connie.Michael@cbsa-asfc.gc.ca>
Sent: Thursday, August 6, 2015 10:37 AM
To: Anderson, Darryl; Proudfoot, Hayley
Cc: Simonson, Lyle; Hewson, Kevin; Singer, Steve
Subject: RE: Wildhorse well

Hayley – We would like to proceed. Lyle is ready to go with the work. I need your commitment that the funds will be recovered by HQ. Let me know as soon as possible.

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch
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From: Anderson, Darryl
Sent: August 6, 2015 9:36 AM
To: Michael, Connie; Proudfoot, Hayley
Cc: Simonson, Lyle; Hewson, Kevin; Singer, Steve
Subject: RE: Wildhorse well

Yes I believe this would be prudent....gets us out in front of what we will need for port replacement and this water and UV tube is having to be cleaned daily which is not convenient for the operation in our busy times...

Thanks Darryl

From: Michael, Connie
Sent: August 6, 2015 8:29 AM
To: Proudfoot, Hayley
Cc: Simonson, Lyle; Anderson, Darryl
Subject: FW: Wildhorse well

Hi Hayley – We can undertake this work ourselves. Do we still have your financial support if we can get the work done by March 31st, 2016.

Please advise as I will have Lyle start the work immediately.

Darryl – Is this the direction you would like us to take rather than wait till next fiscal year?

Thanks,

Connie Michael

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From: Simonson, Lyle
Sent: August 6, 2015 8:49 AM
To: Michael, Connie
Subject: RE: Wildhorse well

Yes. As we have discussed in the past if there are no repercussions from HQ I'm fine with managing the project. If you want to go ahead I am going to have to consult with a driller and meet them out there to drill some test holes to determine where the well should go sooner rather than later.

Lyle Simonson

Facility Officer / Operations Branch

Canada Border Services Agency

Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Cel:306-502-6428 / TTY:1-866-335-3237

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From: Michael, Connie

Sent: August 6, 2015 7:43 AM

To: Simonson, Lyle

Cc: Stackiw, Kenneth

Subject: RE: Wildhorse well

Hi Lyle – Is this something that you can undertake yourself with no involvement from BGIS. We have a similar situation for the POE at Winkler. I have directed Ken to take on the work and proceed |

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch

Canada Border Services Agency / Government of Canada

Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

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Agence des services frontaliers du Canada / Gouvernement du Canada

Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

From: Simonson, Lyle

Sent: August 6, 2015 8:40 AM

To: Michael, Connie

Subject: FW: Wildhorse well

FYI,

Do you agree with this? In the meeting last week Brookfield did not sound hopeful they could do much anything this year as far as our projects are concerned.

Lyle Simonson

Facility Officer / Operations Branch

Canada Border Services Agency

Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Cel:306-502-6428 / TTY:1-866-335-3237

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From: Proudfoot, Hayley

Sent: August 6, 2015 6:21 AM

To: Simonson, Lyle

Subject: RE: Wildhorse well

Hi Lyle,

Thanks for your quick response. Based on this information, I think it's best to remove the project from this year's list and wait until BGIS is in a better situation to do this work.

I'll keep Wild Horse on the corrective action list for next year, and please keep me in the loop if any upgrades to the system are completed by your Region.

Thanks again,
Hayley

From: Simonson, Lyle
Sent: August 4, 2015 4:04 PM
To: Proudfoot, Hayley
Subject: RE: Wildhorse well

Due to RP1, I have to go through BGIS to do this project. Right now it does not look promising that they can get it drilled this year.

Lyle Simonson

Facility Officer / Operations Branch
Canada Border Services Agency
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From: Proudfoot, Hayley
Sent: August 4, 2015 12:56 PM
To: Simonson, Lyle
Subject: RE: Wildhorse well

Hi Lyle,

Hope you've been having a nice summer so far!

Just wanted to touch base and see if any progress has been made with the Boundary Commission and the Wildhorse Well. We have been getting a great amount of pressure from our new Executive Director to ensure that SSA's are signed for all major projects, and have been told that if funding is not secured by the end of August, the project will be pulled for the remainder of the fiscal year, no exceptions. Do you have any insight to whether we can get a project proposal and an SSA in place by this time?

I'm free to chat if you would like to discuss.

Thanks,
Hayley

From: Simonson, Lyle
Sent: June 25, 2015 12:19 PM
To: Proudfoot, Hayley
Subject: Re: Wildhorse well

No we would put it on canadian side. Wildhorse is contaminated from years of septic pump out. We want to drill off government property. Pwgsc advised trying to procure land to do this from private landowners can be a time consuming and sometimes expensive proposition. Drilling in no mans land costs nothing and only requires boundary commission approval. The well at Del Bonita was done this way years ago.

Sent from my BlackBerry handheld.
Envoyé à partir de mon BlackBerry.

From: Proudfoot, Hayley
Sent: Thursday, June 25, 2015 10:13 AM
To: Simonson, Lyle
Subject: RE: Wildhorse well

Hi Lyle,

Checked with the group here and no one has experience working with boundary commission. Are you having to go through them because the well is located on the US side?

Thanks for the update,
Hayley

From: Simonson, Lyle
Sent: June 25, 2015 11:41 AM
To: Proudfoot, Hayley
Subject: Re: Wildhorse well

Working on it. Going to have to discuss with boundary commission about putting it in no mans land. Do you have any experience working with them?

Sent from my BlackBerry handheld.
Envoyé à partir de mon BlackBerry.

From: Proudfoot, Hayley
Sent: Thursday, June 25, 2015 09:19 AM
To: Simonson, Lyle
Subject: RE: Wildhorse well

Hi Lyle,

Hope you've been having a nice start to the summer!

Just checking in on the status of the new Wildhorse well. Has the project begun? Are you expecting the project to be complete this fiscal year?

Any updates you can provide would be greatly appreciated.

Thanks very much,
Hayley

Hayley Proudfoot
Environmental Analyst | Analyste de l'environnement
Environmental Programs Division | Division des programmes environnementaux
Canada Border Services Agency | Agence des services frontaliers du Canada
355 North River Road, Tower B, 19th Floor, Room 19025 | 355 chemin North River, tours B, 19e étage, 19025
Ottawa, ON K1A 0L8

Telephone: (343) 291-5834
Blackberry: (613) 866-7144

Email : Hayley.Proudfoot@cbsa-asfc.gc.ca

From: Simonson, Lyle
Sent: May 21, 2015 12:28 PM
To: Bowman, Stephan
Cc: Michael, Connie; Proudfoot, Hayley
Subject: RE: Wildhorse well

Yes BGIS will be managing the project for us.

Thanks,

Lyle Simonson

Facility Officer / Operations Branch
Canada Border Services Agency
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Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Tél. cell.:306-502-6428 / ATS:1-866-335-3237

From: Bowman, Stephan
Sent: May 21, 2015 10:20 AM
To: Simonson, Lyle
Cc: Michael, Connie; Proudfoot, Hayley
Subject: RE: Wildhorse well

Sounds good Lyle. It may still need a new treatment system though, otherwise we could just end up posting non potable signage!

I advise we drill a new well, then after water quality testing determine exactly what treatment system is necessary.

Would like to see a proposal for a new well, including potential treatment options. For internal approvals.

Curious - is BGIS involved in this project at all?

Cheers,

Steve

From: Simonson, Lyle
Sent: May 21, 2015 11:59 AM
To: Bowman, Stephan; Michael, Connie
Cc: Proudfoot, Hayley
Subject: RE: Wildhorse well

Stephan,

The driver behind this is well failure rather than poor quality water. As the site is contaminated with septic waste the original well driller has suggested we move the well off site. We may not improve the dissolved solid situation but we will get away from site contamination.

Thanks,

Lyle Simonson

Facility Officer / Operations Branch
Canada Border Services Agency
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Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Tél. cell.:306-502-6428 / ATS:1-866-335-3237

From: Bowman, Stephan
Sent: May 21, 2015 9:41 AM
To: Michael, Connie
Cc: Simonson, Lyle; Proudfoot, Hayley
Subject: RE: Wildhorse well

Hi Connie,

By HQ, do you mean Environment or Ed?

We support the installation of a new well. Unfortunately a new well may not solve all the water quality issues at Wildhorse. It is likely that the groundwater even at that depth will be high in dissolved solids such as sodium and sulphate and will require treatment (typically Reverse Osmosis) before it is potable. Once the well is drilled, water quality results can determine the type of treatment system required.

Also, siting of a new well and installation of a new treatment system (re-use of equipment) should take into account that Wildhorse is slated for redevelopment under P3.

Regardless of who's budget (at HQ) this comes out of, I would like to see a proposal that addresses the new well and potential treatment system.

Cheers,

Steve

Stephan Bowman
Manager Environmental Operations | Gestionnaire des opérations environnementales
Environmental Programs Division | Division des programmes environnementaux
Canada Border Services Agency | Agence des services frontaliers du Canada
335 North River Road, Tower B, 19th Floor | 335 North River Road, tour B, 19e étage
Ottawa, ON K1A 0L8

Telephone | Téléphone 343-291-5835 ***NOTE: New phone#***

From: Michael, Connie
Sent: May 20, 2015 10:10 AM
To: Simonson, Lyle
Cc: Bowman, Stephan
Subject: RE: Wildhorse well

HQ has advised that they would pay for this. Not an issue.

Connie Michael

Manager of Infrastructure, Operations Branch
Canada Border Services Agency / Government of Canada

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From: Simonson, Lyle
Sent: May 20, 2015 9:03 AM
To: Michael, Connie
Subject: Wildhorse well

Where are we at with funding on this project?

Thanks,

Lyle Simonson

Facility Officer / Operations Branch
Canada Border Services Agency
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Crupi, Kayla

From: Marsden, Kelly
Sent: August 10, 2015 10:41 AM
To: Proudfoot, Hayley
Subject: Fw: Water Situation at POE Wild Horse

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Simonson, Lyle <Lyle.Simonson@cbsa-asfc.gc.ca>
Sent: Monday, August 10, 2015 9:51 AM
To: Michael, Connie; Marsden, Kelly
Subject: RE: Water Situation at POE Wild Horse

I have sent a request to the International Boundary Commission to gain permission to have a seismologist out to assess if there is water on Boundary land we can access.

Thanks,

Lyle Simonson

Facility Officer / Operations Branch
Canada Border Services Agency
Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Cel:306-502-6428 / TTY:1-866-335-3237

Agent des installations / Direction générale des opérations
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Lyle.Simonson@cbsa-asfc.gc.ca / 306-780-8372 / Tél. cell.:306-502-6428 / ATS:1-866-335-3237

From: Michael, Connie
Sent: August 7, 2015 9:31 AM
To: Marsden, Kelly
Cc: Simonson, Lyle
Subject: RE: Water Situation at POE Wild Horse

Hi Kelly – We will do our best to move this project along. Lyle has been working on the file for some time so he is aware of what needs to be done and how to get it done. We will ensure we keep your group informed of all developments if the project is approved.

Thank you again for your support.

Connie Michael

Manager of Infrastructure, Operations Branch
Canada Border Services Agency / Government of Canada
Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

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Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

From: Marsden, Kelly
Sent: August 7, 2015 10:28 AM
To: Michael, Connie

Cc: Simonson, Lyle
Subject: RE: Water Situation at POE Wild Horse

No problème.

As you know we are keen to complete this project too and were disappointed that it could be actioned last year!

Cheers,
K

From: Michael, Connie
Sent: August 7, 2015 11:26 AM
To: Marsden, Kelly
Cc: Simonson, Lyle
Subject: RE: Water Situation at POE Wild Horse

Thanks Kelly. Lyle is away today but I will have him action with BGIS first thing Monday morning.

Thank you again for your assistance.

Connie Michael

Manager of Infrastructure, Operations Branch
Canada Border Services Agency / Government of Canada
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From: Marsden, Kelly
Sent: August 7, 2015 10:24 AM
To: Michael, Connie
Subject: RE: Water Situation at POE Wild Horse

Hi Connie :

I need something in writing from BGIS that details the timelines and the cost and/or them declining this work.

Also, once the well is installed and the water is tested there will likely be a requirement for treatment. Then needs to be considered in the way forward too. Stephan Bowman was clear with Lyle that this project is not just the well maybe that is the confusion on price and timeline with BGIS.

Please get something from BGIS asap so we can move forward asap.
Thanks,
K

From: Michael, Connie
Sent: August 7, 2015 11:12 AM
To: Singer, Steve; Simonson, Lyle
Cc: Hewson, Kevin; Anderson, Darryl; Marsden, Kelly
Subject: RE: Water Situation at POE Wild Horse

Hi Steve – Thank you for your email. I have requested that HQ allow us to move forward with this project. BGIS cannot do this work within our timeframes and it is twice as much money than what we can do the work for. I am waiting for approval from HQ but feel confident they will allow Infrastructure to proceed with the Wildhorse Well.

I have cc'd the Director of Environmental Services.

Thanks,

Connie Michael

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From: Singer, Steve
Sent: August 6, 2015 4:52 PM
To: Simonson, Lyle; Michael, Connie
Cc: Hewson, Kevin; Anderson, Darryl
Subject: Water Situation at POE Wild Horse

In regards to the above matter I think it appropriate that we take another look at options for this location.

We are spending a considerable amount of money, time and manpower trying to hold the water system together and then manage the treatment process. This part of Alberta is not known to have a great water supply and I think we have proven that with all of our past efforts to maintain a proper clean supply for our facility.

I know it has been discussed in the past but I would like to revisit the option of having water stored onsite (cistern), supported by monthly resupply (water hauling).

Some of the logistics are that if we had a 5000 gallon storage tank, we might need to haul water to the site monthly. We are aware that water haulers in the area can carry 3500 gallons for each truck load. Each load of water will cost CBSA approx. \$450. I think drilling a new well and then trying to support the water system will once again prove to be problematic and excessively expensive as we have proven in the past. The math makes sense to me on this unless there is something I'm not aware of.

Can we discuss moving to a stored water option instead of a well?

S

Steve Singer

A/Chief, Operations Branch
Canada Border Services Agency / Government of Canada
Steve.Singer@cbsa-asfc.gc.ca / Tel: 403-647-7452 / TTY: 1-866-335-3237

A/Chef, Direction générale des opérations
Agence des services frontaliers du Canada / Gouvernement du Canada
Steve.Singer@cbsa-asfc.gc.ca / Tél: 403-647-7452 / ATS: 1-866-335-3237

Crupi, Kayla

From: Marsden, Kelly
Sent: August 10, 2015 03:31 PM
To: Michael, Connie
Cc: Simonson, Lyle
Subject: RE: Water Situation at POE Wild Horse

So we are now back to the original problem ... how we contract this?

We need BGIS to decline the work before we can commence to do it ourselves (Presumably under an SSA with PWGSC).

Can anyone provide me that in writing?

Thanks,
K

From: Michael, Connie
Sent: August 10, 2015 3:27 PM
To: Marsden, Kelly
Cc: Simonson, Lyle
Subject: FW: Water Situation at POE Wild Horse

Hi Kelly – I had a chance to talk to Lyle. Please see email from Lyle and the reason why we should pursue the well instead of the cistern.

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch
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From: Simonson, Lyle
Sent: August 10, 2015 2:26 PM
To: Singer, Steve; Michael, Connie
Cc: Hewson, Kevin; Anderson, Darryl
Subject: RE: Water Situation at POE Wild Horse

The biggest issue we have with the well is E. Coli and coliforms (bacteria). The well is contaminated from years of septic pump out anywhere and everywhere on CBSA property. The thought was to drill off property and get away from the septic contamination. Having a cistern will not avoid bacteria. As it's an open system every time water is brought in or someone opens the lid its being exposed to bacteria. In my limited experience, cistern water has to be treated much like what is currently done at Wildhorse. I'm not convinced you will gain anything by going to a cistern vs a well in that regard.

The issues we have been experiencing with the equipment the past 2 years is a direct cause of a failing well. Both the plumber and the company that drilled the well have indicated this. The current system needs a chlorination device to run in-line with the equipment there now. If this is in place maintenance would only be required every 6 months as per the plumber. The chlorination system would be necessary for either cistern or well.

Crupi, Kayla

From: Simonson, Lyle
Sent: August 13, 2015 04:05 PM
To: Michael, Connie; Marsden, Kelly
Cc: Proudfoot, Hayley
Subject: RE: Contact at IBC

Drilling on IBC controlled land will not happen. I just talked to Daniel. He indicated they only have 10 feet of land there and it would not be approved to put a well there.

Lyle Simonson

Facility Officer / Operations Branch
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From: Michael, Connie
Sent: August 13, 2015 1:55 PM
To: Marsden, Kelly; Simonson, Lyle
Cc: Proudfoot, Hayley
Subject: RE: Contact at IBC

Thank you Kelly. Your support to the Region is greatly appreciated.

Lyle – You are away tomorrow. Please let BGIS know they should contact me. You are also travelling next week and leave me as your contact. Should I call BGIS on your behalf? Give me the contact name and I will make it happen.

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch
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From: Marsden, Kelly
Sent: August 13, 2015 2:53 PM
To: Simonson, Lyle
Cc: Michael, Connie; Proudfoot, Hayley
Subject: RE: Contact at IBC

Hi Guys :

Just wanted to advise that Hayley and I had a lengthy call with Steve Singer this afternoon to defend my recommendation to proceed with the installation of the well.

While disappointed, I think Steve understands the legislative environment we are operating in and my expectations that BGIS will be responsible in ensuring the proper operation of the systems and well once installed.

As soon as BGIS get back to you on a go/no go I can authorize the funds for the project.

Lyle, do you have a contingency plan if the semiologist does not find a recommended location to try drilling the well?? Any or a negative response from the IBC?

Please advise.

Thanks,

K

From: Simonson, Lyle
Sent: August 13, 2015 10:35 AM
To: Marsden, Kelly
Subject: RE: Contact at IBC

Connie and I have both reviewed it. It looks great and should hopefully put the issue to rest. I will send it out to the chiefs and director for that region this morning.

Thanks,

Lyle Simonson

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From: Marsden, Kelly
Sent: August 13, 2015 8:22 AM
To: Simonson, Lyle
Subject: FW: Contact at IBC

This is the only additional info Ted had.

Sorry!

K

p.s Did you or Connie have any comments on my email?

From: Elborn, Edward (Ted)
Sent: August 13, 2015 9:24 AM
To: Marsden, Kelly
Subject: RE: Contact at IBC

Kelly,

I've got this link:

<http://www.internationalboundarycommission.org/contact.html>

That's all that I have.

Ted

Ted Elborn, MAATO, PMP

Project Manager/Gestionnaire de projet
Canada Border Services Agency/Agence des services frontaliers du Canada
Infrastructure and Environmental Operations Directorate/Comptrollership Branch
Infrastructure et opérations environnementales/La Direction générale du contrôle
Government of Canada / Gouvernement du Canada
Ted.Elborn@cbsa-asfc.gc.ca 343-291-5813

From: Marsden, Kelly
Sent: August 12, 2015 6:38 PM
To: Elborn, Edward (Ted)
Subject: Re: Contact at IBC

Hey Ted.

His voice mail says he is out till Anyone else??

Thanks,
K

Sent from my BlackBerry 10 smartphone on the Rogers network.

From: Elborn, Edward (Ted)
Sent: Wednesday, August 12, 2015 3:48 PM
To: Marsden, Kelly
Subject: RE: Contact at IBC

Daniel Fortin, a.g., A.T.C.

Commission de la frontière internationale - *International Boundary Commission*
Ressources naturelles Canada - *Natural Resources Canada*
615, rue Booth, bureau 575 - 615 Booth Street, Room 575
Ottawa (Ontario) K1A 0E9 - *Ottawa, Ontario K1A 0E9*
<http://www.internationalboundarycommission.org/>
Tel. 613-944-4515
Cell. 613-808-2758
Fax. 613-992-1122
Gouvernement du Canada - *Government of Canada*

From: Marsden, Kelly
Sent: August 12, 2015 3:45 PM
To: Elborn, Edward (Ted)
Subject: Contact at IBC

Can you give me one for my regional pal Lyle in Prairies. Try to drill a well.

Cheers,
K

Sent from my BlackBerry 10 smartphone on the Rogers network.

Crupi, Kayla

From: Sheldon Jacobs <Sheldon.Jacobs@pwgsc-tpsgc.gc.ca>
Sent: September 29, 2015 05:46 PM
To: Michael, Connie; Marsden, Kelly; Simonson, Lyle
Cc: Proudfoot, Hayley
Subject: RE: Update on Wildhorse project svp.

Good morning Connie;

With regard to the Wild horse well project and supply of a temporary source of water.

BGIS has advised of the following totals:

- The cost of the temporary retention Tank to temporary resolve the lack of water.

Total Costs = \$12,927.88

- Costs to install water holding tank(requested by Steve Singer), while the Retention tank was being installed. August 22/2015 - AFTER HOURS COST

Total costs - \$ 7054.50

- Seismologist report to identify water locations and depth location

Total cost is - \$4590.

To date \$24,572.38 has been spent to provide 2 temporary water sources and to have a geotechnical test completed to determine the best location to drill a new well.

The original SSA, for the Wildhorse portion, was \$25K. Are we to use the existing SSA to cover the supply of the temporary water supplies or do you want a separate SSA for that?

BGIS has received an estimate of 45K to provide the following:

The scope of work is to drill and create the well at north west corner of the site at a depth of 360 ft. or more base on Seismologist report.

Drill out test hole with the caution of new RCMP antenna now in the vicinity of the proposed well, Install screen assembly and solid casing 2 feet above the flood plains and install filter pack, develop well for service.

A controlled pump out rate for 24 hrs. is required and install a steel protector and varmint proof cover. All to be reported to Alberta Environmental Services.

The trenching of the water lines and new hook ups to the trailer and office space are not included in the 45k , so I spec another 15K for the trenching of 300 meters or so of water lines.

We also have to keep in mind the new trailer being installed October 30th.

Based on the estimates obtained by BGIS we will need to amend the current SSA by 60K, if you wish to proceed with drilling the new well this fiscal year.

The price of the new well is alarming so BGIS has asked the contractors to provide options, one being to see if the temporary holding tank that has been installed can it be winterized?

Thus providing options for a better price/design for a well next spring.

Please advise whether we will be amending the SSA to provide funding for drilling a new well.

If you need anything further, please do not hesitate to contact me.

Sheldon Jacobs
Property & Facility Manager, Saskatchewan

T: (306)975-6936 F: (306)975-5397 C:(306)716-0351

Public Works and Government Services Canada
Government of Canada Building
Suite 110, 101 - 22nd Street East
Saskatoon, Saskatchewan S7K 0E1

From: Michael, Connie [<mailto:Connie.Michael@cbsa-asfc.gc.ca>]
Sent: September-28-15 8:45 AM
To: Marsden, Kelly; Simonson, Lyle; Sheldon Jacobs
Cc: Proudfoot, Hayley
Subject: RE: Update on Wildhorse project svp.

Sheldon – Please provide us financial updates as soon as possible. HQ requires this information to include in their financial forecasts.

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch
Canada Border Services Agency / Government of Canada
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From: Marsden, Kelly
Sent: September 28, 2015 9:41 AM
To: Simonson, Lyle; Michael, Connie
Cc: Proudfoot, Hayley
Subject: Update on Wildhorse project svp.

Hi guys :

I haven't received anything on timelines and or budgets yet.

Please send asap as P6 is rapidly approaching.

Thanks,
K

Kelly Marsden

Director | Environmental Operations Division | Comptrollership Branch
Canada Border Services Agency | Government of Canada
Kelly.marsden@cbsa-asfc.gc.ca | Tel: 343-291-5837

Directrice | Opérations environnementale | Direction générale du contrôle
Agence des services frontaliers du Canada | Gouvernement du Canada
Kelly.marsden@cbsa-asfc.gc.ca | Tél: 343-291-5837

Crupi, Kayla

From: Simonson, Lyle
Sent: January 19, 2016 01:46 PM
To: Proudfoot, Hayley
Subject: RE: CBSA Potable Water: Wild Horse

The plan is to drill next summer. Costs to drill this past fall were almost double what we had anticipated. Hoping that with more time a proper competitive process can be undertaken to obtain more reasonable costs.

Lyle Simonson

Facility Officer / Operations Branch
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From: Proudfoot, Hayley
Sent: January 19, 2016 12:44 PM
To: Simonson, Lyle
Subject: RE: CBSA Potable Water: Wild Horse

Thanks for the info, Lyle.

Do you know if there are still plans to drill a new well? Or has that been scrapped now that the chlorinator is in place?

Hayley

From: Simonson, Lyle
Sent: January 19, 2016 1:38 PM
To: Proudfoot, Hayley
Subject: RE: CBSA Potable Water: Wild Horse

Just some notes on Wildhorse. They do not have cistern or temporary water source anymore. That was a temporary measure back in the summer. BGIS had a chlorination system installed which has cleared up a lot of the issues.

Thanks,

Lyle Simonson

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From: Proudfoot, Hayley
Sent: January 15, 2016 1:53 PM

To: ABRAHAM, GILLES

Cc: Simonson, Lyle; Hanslit, Christine; Stackiw, Kenneth; Mcdougall, Rob; Bowman, Stephan; Morris, Martine; Proudfoot, Hayley

Subject: CBSA Potable Water: Wild Horse

Good afternoon,

The latest water quality results from Wild Horse Port of Entry have arrived. Results can be found in the table below and in the Lab Certificate attached. Field Notes from the site visit are also attached.

Exceedances:

Sodium

The water at Wild Horse is now potable.

| | OFF-POE | OFF-KTC | ATCO-TRAILER-KTC | ATCO-TRAILER-WAS-LEFT | ATCO-TRAILER-WAS-RIGHT |
|--------------------|------------------|------------------|------------------|-----------------------|------------------------|
| Jan 6, 2016 | | | | | |
| E. coli | <1 MPN/100 mL | <1 MPN/100 mL | <1 MPN/100 mL | <1 MPN/100 mL | <1 MPN/100 mL |
| Total coliforms | <1 MPN/100 mL | <1 MPN/100 mL | <1 MPN/100 mL | <1 MPN/100 mL | <1 MPN/100 mL |
| Turbidity | 0.34 NTU | 0.39 NTU | 0.14 NTU | 0.17 NTU | 0.38 NTU |
| Sodium | 1300 mg/L | 1500 mg/L | 1400 mg/L | 1500 mg/L | 1500 mg/L |

The parameters which exceeded Health Canada's Maximum Allowable Concentrations (MAC) in July 2015 have successfully been cleared for two sampling rounds. The new cistern and water source appear to be of good quality as there are only exceedances of sodium, an aesthetic objective under Health Canada's *Guidelines*, during the past two sample rounds. Signage indicating the levels of sodium found in the water should be posted so those on a sodium-reduced diet can be made aware.

Staff may now use the water for all purposes, including consumption.

The consultant's full notes and recommendations can be found below.

If you have any questions please let me know.

Thank you,
Hayley

Hayley Proudfoot
Environmental Analyst | Analyste de l'environnement
Environmental Programs Division | Division des programmes environnementaux
Canada Border Services Agency | Agence des services frontaliers du Canada
355 North River Road, Tower B, 19th Floor, Room 19025 | 355 chemin North River, tours B, 19^e étage, 19025
Ottawa, ON K1A 0L8

Telephone: (343) 291-5834
Blackberry: (613) 866-7144
Email : Hayley.Proudfoot@cbsa-asfc.gc.ca

From: Robert Till [<mailto:robert.till@slrconsulting.com>]
Sent: January 15, 2016 12:38 PM
To: Proudfoot, Hayley

Cc: Brownlee, Michael: PWGSC / TPSGC; Stang, Erin: PWGSC / TPSGC; Gariano, Anthony: PWGSC / TPSGC
Subject: January 2016 CBSA Wild Horse Potable Water Sampling - Aesthetic Objective Exceedances

Hi Hayley,

Complete analytical results for the January 2016 monitoring round at Wild Horse border crossing came in on Friday 15th January (attached) and the samples were tested for the core parameters of E.Coli, Total Coliforms and turbidity plus those additional parameters which exceeded the CDWQ guidelines in the July 2015 sampling round (sodium). All samples exceeded their aesthetic objectives (AO) for sodium. The results were as follows with the exceedances (if present) highlighted in red:

| Sample Location | WILDHORSE-OFF-POE | WILDHORSE-OFF-KTC | WILDHORSE-ATCO TRAILER-KTC | WILDHORSE-ATCO TRAILER-KTC |
|---------------------------------|-------------------|-------------------|----------------------------|----------------------------|
| E.Coli DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | <1.0 |
| Total Coliforms DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | <1.0 |
| Turbidity (NTU) | 0.34 | 0.39 | 0.14 | 0.14 |
| Total Sodium (mg/L) | 1300 | 1500 | 1400 | 1400 |

The MAC exceedances of Total Coliforms which were found in the ATCO trailer distribution points in July 2015 have now been eliminated for two successive sampling rounds, and it appears that the system flush and superchlorination undertaken since the last sampling has solved the problem. It also appears that a new chlorination treatment system has been added at the site which should also help to keep the problem from recurring.

The exceedance of aesthetic objectives do not pose a health risk to site personnel, however they may affect the taste and odour of the water at the site which may prevent personnel consuming the water and as sodium could be a potential health issue for people on low-sodium diets, it is recommended that signage be put up to warn them of the issue. It was indicated that bottled water is currently being used for drinking and food preparation at the site.

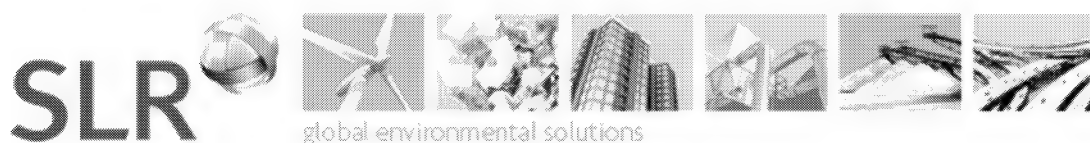
Kind regards,

Robert

Robert Till, M.Sc., P.Geo, FGS
 Senior Hydrogeologist
 SLR Consulting (Canada) Ltd.

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Crupi, Kayla

From: Simonson, Lyle
Sent: October 21, 2014 10:43 AM
To: Bowman, Stephan; Michael, Connie
Cc: De-Beer, Pete; Proudfoot, Hayley
Subject: RE: Wildhorse water

Stephan,

I'm not an expert when it comes to water treatment by any means. I have been advised by our plumber who is very thorough and also does testing of the water that this is the last step for this system. Once the chlorination system is in place it will fix the problems with fouling the UV filter.

Pete,

I am out at Wildhorse Thursday. I will assess the equipment we have out there and come up with what size of room will be required to house it.

Thanks,

Lyle

From: Bowman, Stephan
Sent: October 17, 2014 10:06 AM
To: Michael, Connie
Cc: De-Beer, Pete; Proudfoot, Hayley; Simonson, Lyle
Subject: RE: Wildhorse water

Connie,

I don't mind investing \$11K in a water treatment system if the system can be re-installed in the new port of entry. I just looked at the historical water quality data for this port. It's all over them map. Sodium seems to be the main issue now.

It appears the system could benefit from inline chlorination will help, as the UV filter is likely not providing adequate protection alone. The continuous fouling of the UV system concerns me as well – **Lyle**, what do you think is fouling the UV filter? Seems like the multimedia filter should be removing any particulates. Is it a black slime?

Pete,

Any thoughts on the potential for reusing installed water treatment equipment at a new POE? What is the timeline for the phase II ports?

Steve

Stephan Bowman
Senior Environmental Analyst | Analyste principal de l'environnement
Environmental Programs Division | Division des programmes environnementaux
Canada Border Services Agency | Agence des services frontaliers du Canada
427 Laurier Avenue West, 10th Floor | 427, avenue Laurier Ouest, 10e étage
Ottawa, ON K1A 0L8

Telephone | Téléphone 613-957-2252

Facsimile | Télécopieur 613-948-9286

From: Michael, Connie
Sent: October 16, 2014 8:27 AM
To: Bowman, Stephan
Cc: Simonson, Lyle
Subject: FW: Wildhorse water

Good morning Stephan – As you can see from Lyle's email below, we have issues with the Wildhorse water "again". Please provide direction on how you wish us to proceed.

Thank you Stephan.

Connie Michael, RPA, FMA, CMA 
Manager, Fixed Infrastructure
Prairie Region | région des Prairies
Corporate & Planning Services Division/Division des services corporatifs et des programmes

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Cell: (204) 292-3876
Email/Courriel: connie.michael@cbsa-asfc.gc.ca

From: Simonson, Lyle
Sent: October 14, 2014 11:05 AM
To: Michael, Connie
Subject: Wildhorse water

There are still issues with the water. They are cleaning the sleeve constantly on the UV filter. The water also has sulfur smell from time to time. The solution to fix the problems is a an inline chlorination system. Once again the cost for that is approximately \$11K. This is a reoccurring issue and is going to keep happening until we put in a system.

Thanks,

Lyle Simonson
Facility Officer
Canada Border Services Agency/Agence des services frontaliers du Canada
1871 Hamilton Street
Regina, Saskatchewan
S4P 3W5
Lyle.Simonson@cbsa-asfc.gc.ca
Tel: (306) 780-8372
Fax: (306) 780-7750
Teletypewriter: 1-866-335-3237

Crupi, Kayla

From: Bowman, Stephan
Sent: November 19, 2014 03:25 PM
To: Proudfoot, Hayley
Subject: FW: Wildhorse Water

Importance: High

Let's look at this tomorrow.

Stephan Bowman
Senior Environmental Analyst | Analyste principal de l'environnement
Environmental Programs Division | Division des programmes environnementaux
Canada Border Services Agency | Agence des services frontaliers du Canada
427 Laurier Avenue West, 10th Floor | 427, avenue Laurier Ouest, 10e étage
Ottawa, ON K1A 0L8

Telephone | Téléphone 613-957-2252
Facsimile | Télécopieur 613-948-9286

From: Michael, Connie
Sent: November 19, 2014 3:22 PM
To: Lane, Edward; Bowman, Stephan
Cc: Simonson, Lyle
Subject: FW: Wildhorse Water
Importance: High

Hi Ed – Please see Lyle's email below advising that the well is failing at Wildhorse. We need to do something as soon as possible.

Stephan – do you have any thoughts on the direction on which we should proceed?

We believe that we can dig a new well for approximately \$25K.

Thanks,

Connie

From: Simonson, Lyle
Sent: November 19, 2014 2:17 PM
To: Michael, Connie
Subject: Wildhorse Water

The well at Wildhorse is failing. When it fails there is a lot of sediment that comes into the water. As a result it is causing a lot of grief with our water conditioning equipment. To fix it so we can actually use the water and get the sediment out could be as much as \$5,000. We are already looking at about \$11K for an in line chlorination system. I'm wondering if we should scrap this idea and look at drilling a new well? Part of the reason we have high coliforms in the well is because its sitting right beside an old septic field and is contaminated. We may be able to go off site a ways and find a non-contaminated water source which could eliminate a number of the problem we have with our water including coliforms.

Note I had a 326ft well drilled in Monchy 2 years ago which cost about \$26K. The current well is 300ft at Wildhorse so I think we could likely drill a well for \$25K.

Thanks,

Lyle Simonson
Facility Officer
Canada Border Services Agency/Agence des services frontaliers du Canada
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S4P 3W5
Lyle.Simonson@cbsa-asfc.gc.ca
Tel: (306) 780-8372
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Crupi, Kayla

From: Michael, Connie
Sent: August 21, 2015 11:24 AM
To: Jacobs, Sheldon: PWGSC / TPSGC
Cc: 'Walter Espinoza'; Singer, Steve; Marsden, Kelly
Subject: I have approved funding to get water to this port

What else is required to make this happen. Money is not the issue.

We are doing long term solutions which is a separate issue. I want water to the port to ensure the port is not shut down.

Connie Michael

Manager of Infrastructure, Operations Branch
Canada Border Services Agency / Government of Canada
Connie.Michael@cbsa-asfc.gc.ca / Tel: 204-983-4622 / Cell: 204-292-3876 / TTY: 866-335-3237

Gestionnaire de l'infrastructure, Direction générale des opérations
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Wild Horse Call - PWGSC, BGIS, CBSA Date Sept. 8, 2015

- Vendors need to follow federal guidelines/laws
- Vendors don't want to drill without environmental consultant (contaminated site)
- Env. consultant "costs" 2-3 weeks → not needed.
 - ↳ we have enough info from Risk Assessments, ESA's, etc. that we don't need a consultant
- Going out to multiple vendors (emergency project - work order)
 - ↳ SSA & paperwork later once vendors set
 - ↳ don't want to wait for signatures, etc.
- Walter's role is to keep everything moving along
- Lyle is CBSA's liason
- Deadline: end of October (PWGSC)
 - ↳ emergency project allows bypassing of paperwork, etc.
- Progress reports coming regularly from PWGSC / BGIS
- Lyle: Soil testing b/c of contaminated septic?
 - ↳ Any contaminated sites should be labelled on existing maps
- Treatment system will need to be installed as well

* Follow-up @ Chertville *

Crupi, Kayla

From: Proudfoot, Hayley
Sent: December 11, 2014 02:13 PM
To: Michael, Connie
Subject: National Potable Water Monitoring Program Round 3
Attachments: Prairie Region NPWMP Sampling Events Calendar.doc

Hi Connie,

Please be informed that Round 3 of sampling for the National Potable Water Monitoring Program at select Prairie Region ports of entry have been scheduled. Please find the proposed dates in the attached documents.

Thank you,
Hayley

***PLEASE NOTE MY NEW OFFICE ADDRESS AND TELEPHONE NUMBER, EFFECTIVE WEDNESDAY NOVEMBER 26TH, 2014.**

Hayley Proudfoot

Environmental Analyst | Analyste de l'environnement

Environmental Programs Division | Division des programmes environnementaux

Canada Border Services Agency | Agence des services frontaliers du Canada

333 North River Road, Tower A, 18th Floor, Room 18034 | 333 chemin North River, tours A, 18e étage, 18034

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Telephone: (343) 291-5834

Blackberry: (613) 866-7144

Email : Hayley.Proudfoot@cbsa-asfc.gc.ca

Prairie Region NPWMP Sampling Events 2014-15

| Port of Entry | Round 1 | Round 2 | Round 3 | Round 4 |
|------------------------------------|---|---|---|----------------|
| Aden | September 16, 2014 (full parameters) | October 21, 2014 (full parameters) | SCHEDULED *week of* January 19 (bacteria, turbidity, select parameters) | March/April ?? |
| Chief Mountain (Well 1) | September 18, 2014 (full parameters) | PORT CLOSED | PORT CLOSED | March/April ?? |
| Chief Mountain (Well 2) | September 18, 2014 (full parameters) | PORT CLOSED | PORT CLOSED | March/April ?? |
| Del Bonita | September 18, 2014 (full parameters) | October 22, 2014 (full parameters) | SCHEDULED *week of* January 19 (bacteria, turbidity, select parameters) | March/April ?? |
| Lyleton | September 11, 2014 (full parameters) | October 28, 2014 (bacteria & turbidity) | SCHEDULED January 6, 2014 (bacteria & turbidity) | March/April ?? |
| Regway | September 11, 2014 (full parameters) | October 23, 2014 (bacteria & select parameters) | SCHEDULED *week of* January 26 (bacteria, turbidity, select parameters) | March/April ?? |
| Wild Horse | September 16, 2014 (full parameters) | October 21, 2014 (full parameters) | SCHEDULED *week of* January 19 (bacteria, turbidity, select parameters) | March/April ?? |

Crupi, Kayla

From: Morris, Martine
Sent: February 27, 2015 08:22 AM
To: Morris, Martine
Subject: New ATCO trailer

New ATCO trailer. Residences condemned and vacant. Port slated for replacement 2015/2016

From: Morris, Martine
Sent: February 26, 2015 3:03 PM
To: Proudfoot, Hayley
Subject: RE: Question: water at Wild Horse POE

Did a bit of research and poking around...and got my answer. See the link below. So, yes there's a kitchen. Do you want us to sample the washrooms as well?

From: Morris, Martine
Sent: February 26, 2015 2:41 PM
To: Proudfoot, Hayley
Subject: RE: Question: water at Wild Horse POE

I will let Robert know. I wish Connie and Lyle had explained a bit further what was going on with the residences though. Why are they condemned and longer living in them? I wonder if Stephan knows about this? Do you mind if I forward this to him and ask, or do you prefer asking him yourself?

I also wish they had explained the trailer situation a bit more. Is there a kitchen in the trailer? And if yes, are we sampling only in the kitchen or the bathroom as well?

From: Proudfoot, Hayley
Sent: February 26, 2015 2:35 PM
To: Morris, Martine
Subject: FW: Question: water at Wild Horse POE

Hi Martine,

Here is the answer from Prairie Region. No need to sample in the houses, but sampling is required in the ATCO trailer. Do you mind forwarding on to Robert?

Thanks,
Hayley

From: Simonson, Lyle
Sent: February 26, 2015 2:16 PM
To: Michael, Connie; Proudfoot, Hayley
Subject: RE: Question: water at Wild Horse POE

No need to sample in the houses. Sampling the trailer is sufficient.

Thanks,

Lyle Simonson

Facility Officer / Operations Branch
Canada Border Services Agency
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From: Michael, Connie
Sent: February 26, 2015 12:18 PM
To: Simonson, Lyle; Proudfoot, Hayley
Subject: FW: Question: water at Wild Horse POE

Hi Lyle – Please give us your comments on this? I would like to hold off on the houses but I respect your opinion.

Thanks,

Connie Michael

Manager of Infrastructure, Operations Branch
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From: Proudfoot, Hayley
Sent: February 26, 2015 12:11 PM
To: Michael, Connie
Subject: Question: water at Wild Horse POE

Hi Connie,

After water sampling was last conducted in January 2015 at the Wild Horse port of entry, the consultant, Robert Till from SLR Consulting, made a recommendation. He suggests no longer sampling at the residences as they are no longer occupied, and instead sampling inside the ATCO trailer. Do you feel this makes sense? Will the houses soon be occupied – therefore should we continue to sample there to continue observing water quality inside the residences? Or will they continue to be empty? Do you feel the ATCO trailer needs to be sampled?

Thanks for your help and time,
Hayley

Hayley Proudfoot
Environmental Analyst | Analyste de l'environnement
Environmental Programs Division | Division des programmes environnementaux
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From: Robert Till [mailto:rtill@slrconsulting.com]
Sent: February 26, 2015 12:50 PM
To: Morris, Martine
Subject: RE: CBSA Potable Water: Wild Horse

Hi Martine,

Before I make the final recommendations on this I would like to speak to the site staff to make sure we are recommending the best course of action for them, and to make sure we are not going to stop the sampling at the houses if for any reason water is still being used there. Please would you be able to provide me with the phone number of the office there so I can call?

Many thanks in advance,

Robert

From: Morris, Martine [mailto:Martine.Morris@cbsa-asfc.gc.ca]
Sent: February 26, 2015 7:04 AM
To: Robert Till
Cc: Proudfoot, Hayley
Subject: FW: CBSA Potable Water: Wild Horse

Good morning Robert~

Hope you are doing well.

Would it be possible to send us the report for this sampling result in PDF format?

Also, following your suggestion to sample at the ATCO trailer in April instead of the residences, can you please advise if the Sample Point Location in the trailer will be the kitchen or bathroom location? Or both?

Thank you,

Martine Morris

Environmental Operations | Opérations environnementales
Canada Border Services Agency | Agence des services frontaliers du Canada
333 North River Road, 18th Floor | 333, rue North River, 18e étage
Ottawa, ON K1A 0L8

Telephone | Téléphone 343-291-5833

From: Robert Till [mailto:rtill@slrconsulting.com]
Sent: February 2, 2015 11:55 AM
To: Proudfoot, Hayley
Cc: Brownlee, Michael: PWGSC / TPSGC; Stang, Erin: PWGSC / TPSGC; Gariano, Anthony: PWGSC / TPSGC
Subject: January 2015 CBSA Wild Horse Potable Water Sampling - Aesthetic Objective Exceedences Only

Hi Hayley,

Complete analytical results for the January 2015 monitoring round at Wild Horse border crossing came in on Wednesday (attached) and indicated that no parameters exceeded their maximum allowable concentrations (MAC), however all samples exceeded their aesthetic objectives (AO) for total dissolved solids, chloride and sodium. pH in the eastern residence and dissolved sulphate in both residences also exceeded the aesthetic objectives. The results were as follows with the exceedances (if present) highlighted in red:

| Sample Location | WILDHORSE_OFF_POE | WILDHORSE_OFF_KTC | WILDHORSE_OFF_RES-E-KTC | WILDHORSE_W-KTC |
|-----------------------------------|-------------------|-------------------|-------------------------|-----------------|
| Total Dissolved Solids (mg/L) | 2900 | 2800 | 3000 | |
| pH | 7.62 | 7.61 | 8.98 | |
| Total Cadmium (ug/L) | <0.020 | <0.020 | <0.020 | |
| Alkalinity (Total as CaCO3)(mg/L) | 37 | 54 | 320 | |
| Bicarbonate (mg/L) | 45 | 66 | 330 | |
| Carbonate (mg/L) | <0.50 | <0.50 | 28 | |
| Hydroxide (mg/L) | <0.50 | <0.50 | <0.50 | |
| Dissolved Sulphate (mg/L) | 6.3 | 3.6 | 1100 | |
| Dissolved Chloride (mg/L) | 1900 | 1800 | 660 | |
| E.Coli DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | |
| Total Coliforms DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | |
| Turbidity | 0.67 | 0.68 | 0.36 | |
| Total Aluminum (mg/L) | <0.0030 | <0.0030 | 0.0053 | |
| Total Antimony (mg/L) | <0.00060 | <0.00060 | <0.00060 | |
| Total Arsenic (mg/L) | <0.00020 | <0.00020 | 0.00025 | |
| Total Barium (mg/L) | <0.010 | <0.010 | <0.010 | |
| Total Boron (mg/L) | 0.84 | 0.84 | 0.84 | |
| Total Calcium (mg/L) | 0.42 | 0.45 | <0.30 | |
| Total Chromium (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Copper (mg/L) | 0.0036 | 0.0095 | 0.037 | |
| Total Iron (mg/L) | <0.060 | <0.060 | <0.060 | |
| Total Lead (mg/L) | <0.00020 | 0.00038 | 0.00051 | |
| Total Lithium (mg/L) | 0.13 | 0.046 | 0.16 | |
| Total Magnesium (mg/L) | <0.20 | <0.20 | <0.20 | |
| Total Manganese(mg/L) | <0.0040 | <0.0040 | <0.0040 | |
| Total Phosphorus (mg/L) | <0.10 | <0.10 | <0.10 | |
| Total Potassium (mg/L) | 1.8 | 1.4 | 1.6 | |
| Total Selenium (mg/L) | <0.00020 | 0.00021 | 0.0004 | |
| Total Silicon (mg/L) | 2.9 | 3 | 2.4 | |
| Total Sodium (mg/L) | 1100 | 1100 | 1100 | |
| Total Strontium (mg/L) | <0.020 | <0.020 | <0.020 | |
| Total Sulphur (mg/L) | <0.20 | <0.20 | 350 | |
| Total Titanium (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Uranium (mg/L) | <0.00010 | <0.00010 | 0.00015 | |
| Total Zinc (mg/L) | 0.0048 | 0.02 | 0.012 | |
| Total Mercury (ug/L) | <0.0020 | <0.0020 | <0.0020 | |

The exceedence of aesthetic objectives and operational guidance guidelines do not pose a health risk to site personnel, however they may affect the taste and odour of the water at the site which may prevent personnel consuming the water. It was indicated that bottled water is currently being used for drinking and food preparation at the site. As sodium could be a potential health issue for people on low-sodium diets, it is recommended that signage be put up to warn them of the issue. The high concentrations of both sodium and chloride could potentially indicate a salt source such as road salt which may be preventable. No obvious sources were observed on site. There were several further issues of note:

- Site personnel noted that the bottled water cooler had not been cleaned for several months as the site staff were not aware of how to clean it. It is recommended that the cooler be professionally cleaned, and/or training is provided for site staff to enable cleaning of the cooler on a regular basis.
- It is noted that water quality has changed at the sampling points within the residences, with increases in sulphate (now above guidelines) and sulphur and a drop in chloride. It was noted by site personnel that the residences had been condemned and were seldom used, with staff residing in an ATCO trailer now on site. With this in mind, it is suggested that the residence sample points 2D416 (residence east) and 2D417 (residence west) be dropped from the April sampling, and replaced by the point of use within the ATCO trailer (if present) and at the office water cooler if cleaning can't be arranged.

Kind regards,

Robert

Robert Till, M.Sc., P.Geo, FGS
Senior Hydrogeologist
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Crupi, Kayla

From: Proudfoot, Hayley
Sent: November 4, 2014 02:13 PM
To: Michael, Connie
Cc: Stang, Erin: PWGSC / TPSGC; Brownlee, Michael: PWGSC / TPSGC; Gariano, Anthony: PWGSC / TPSGC; Von Schoenberg, Paul: PWGSC / TPSGC; Bowman, Stephan; Morris, Martine; 'Robert Till'
Subject: Potable Water: Summary of Results for Round 2 Sampling in Prairie Region
Attachments: B495257V1-R2014-10-28_16-49-09_R006.pdf; B495672V1-R2014-10-27_15-41-12_R006.pdf; B497994V1-R2014-10-31_10-43-20_R006.pdf; 00345556.pdf; 00345555.pdf; 00345554.pdf; 00345553.pdf; 00345551.pdf; 00345552.pdf; 00345557.pdf; B495234V1-R2014-10-29_16-30-31_R006.pdf

Hi Connie,

I have received the results from Round 2 of sampling throughout the Prairie Region. A summary of the findings is below, and full reports are attached to this email.

Note: Exceedances are highlighted in **red**.

Aden

| Sample Location | ADEN_OFF_POE | ADEN_OFF_KTC | GCDWQ |
|-----------------------------------|--------------|--------------|---------------------|
| Ion Balance | 0.98 | 0.99 | |
| Total Dissolved Solids (mg/L) | 1200 | 1200 | <500 (AO) |
| Total Cadmium (ug/L) | <0.020 | <0.020 | <5 (MAC) |
| Alkalinity (Total as CaCO3)(mg/L) | 560 | 560 | |
| Bicarbonate (mg/L) | 690 | 690 | |
| Carbonate (mg/L) | <0.50 | <0.50 | |
| Hydroxide (mg/L) | <0.50 | <0.50 | |
| E.Coli DST (mpn/100mL) | <1.0 | <1.0 | None detected (MAC) |
| Total Coliforms DST (mpn/100mL) | <1.0 | <1.0 | None detected (MAC) |
| Turbidity (NTU) | <0.10 | 0.14 | <1 (OG) |
| Total Aluminum (mg/L) | 0.0064 | 0.011 | <0.1 (OG) |
| Total Antimony (mg/L) | <0.00060 | <0.00060 | <0.006 (MAC) |
| Total Arsenic (mg/L) | <0.00020 | <0.00020 | <0.010 (MAC) |
| Total Barium (mg/L) | <0.010 | <0.010 | <1 (MAC) |
| Total Boron (mg/L) | 0.28 | 0.28 | <5 (MAC) |
| Total Calcium (mg/L) | 0.66 | 0.67 | |
| Total Chromium (mg/L) | <0.0010 | <0.0010 | <0.050 (MAC) |
| Total Copper (mg/L) | 0.00034 | 0.0024 | <1 (AO) |
| Total Iron (mg/L) | 0.11 | 0.086 | <0.3 (AO) |
| Total Lead (mg/L) | <0.00020 | <0.00020 | <0.010 (MAC) |
| Total Lithium (mg/L) | <0.020 | 0.02 | |
| Total Manganese(mg/L) | <0.0040 | 0.0069 | <0.050 (AO) |
| Total Phosphorus (mg/L) | <0.10 | <0.10 | |
| Total Potassium (mg/L) | 0.73 | 0.74 | |
| Total Selenium (mg/L) | <0.00020 | <0.00020 | <0.010 (MAC) |

| | | | |
|------------------------|---------|---------|--------------|
| Total Silicon (mg/L) | 7.4 | 7.1 | |
| Total Sodium (mg/L) | 440 | 430 | <200 (AO) |
| Total Strontium (mg/L) | <0.020 | <0.020 | |
| Total Sulphur (mg/L) | 140 | 130 | |
| Total Titanium (mg/L) | <0.0010 | <0.0010 | |
| Total Uranium (mg/L) | 0.00021 | 0.00019 | <0.020 (MAC) |
| Total Zinc (mg/L) | 0.003 | 0.0045 | <5 (AO) |

Consultant's notes: Complete analytical results for the October 2014 monitoring round at Aden and indicated that no parameters exceeded their maximum allowable concentrations (MAC), however both samples exceeded their aesthetic objectives (AO) for total dissolved solids and sodium.

Consultant's recommendations: The exceedence of aesthetic objectives and operational guidance guidelines do not pose a health risk to site personnel, however they may affect the taste and odour of the water at the site which may prevent personnel consuming the water. It was indicated that bottled water is currently being used for drinking and food preparation at the site. As sodium could be a potential health issue for people on low-sodium diets, it is recommended that signage be put up to warn them of the issue.

Hayley's notes: Hayley will follow up with Connie to discuss possible treatment options to eliminate total dissolved solids and sodium from the water.

Del Bonita

| Sample Location | DEL BONITA-OFF-POE | DEL BONITA-OFF-KTC | DEL BONITA-OFF-RES | GCDWQ |
|-----------------------------|--------------------|--------------------|--------------------|-------------------|
| E.Coli DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | None detected (M) |
| Total Coliforms (mpn/100mL) | <1.0 | <1.0 | <1.0 | None detected (M) |
| Turbidity (NTU) | <0.10 | <0.10 | <0.10 | <1 (OG) |

Consultant's notes: Complete analytical results for the October 2014 monitoring round at Del Bonita indicated that no parameters exceeded their maximum allowable concentrations (MAC), aesthetic objectives (AO) or operational guidelines (OG).

Consultant's recommendations: Based on the potable water sampling undertaken there were no exceedances of health based, aesthetic or operational based guidelines. This indicates that water is of good quality at this site. A regular maintenance schedule should be continued to maintain the water quality status at this site.

Hayley's notes: Water continues to be potable.

Lyleton

| Sample Location | LYLETON-OFF-POE | LYLETON-OFF-KTC | LYLETON-OFF-KTC-REV OSM | LYLETON-OFF-W |
|----------------------|-----------------|-----------------|-------------------------|---------------|
| Turbidity (NTU) | 1.2 | 0.6 | <0.1 | 0.2 |
| E. coli (QT) | 0 | 0 | 0 | 0 |
| Total Coliforms (QT) | 0 | 0 | 0 | 0 |

Consultant's notes: Please be advised that turbidity exceeded the operational guidance (OG) level in one out of four samples collected from the Lyleton, MB site. Complete analytical results for the monitoring round indicated that no other parameters exceeded their maximum allowable concentrations (MAC), aesthetic objectives (AO) or operational guidance (OG) guidelines. It is noted that the Total Coliform MAC exceedances observed in September 2014 have not been repeated in this sampling round. This may indicate that any remedial actions taken since the September 2014 sampling were implemented and have been successful.

Consultant's recommendations: The field notes indicate that a "Do not Drink" advisory is posted, however they indicated that bottled water is being used for drinking. The turbidity operational guidance exceedance at the point of entry sample point (LYLETON- OFF-POE) indicates that turbidity may be an issue at the water source, however the OG guideline was not exceeded at the points of use, which potentially indicates that the water treatment is being effective at reducing the turbidity of water at the site.

Hayley's notes: Though bacteria was not present in this sampling round, 'Boil Water Advisory' signage should continue to be posted until the next sampling round comes back clean for bacteria as well.

Regway

| Sample Location | REGWAY-RESTS-KTC | REGWAY-OFF-KTC | REGWAY-OFF-FP | REGWAY-OFF-WAS-PUB | REGWAY-RESHN-KTC | REGWAY-OFF-POE | REGWAY-RESHM-KTC | GCDWQ |
|-------------------------------|------------------|----------------|---------------|--------------------|------------------|----------------|------------------|---------------------|
| Total Coliform (orgs / 100mL) | None detected | None detected | None detected | None detected | None detected | None detected | None detected | None detected (MAC) |
| E. Coli (orgs / 100mL) | None detected | None detected | None detected | None detected | None detected | None detected | None detected | None detected (MAC) |
| Turbidity (N.T.U.) | 1.4 | <0.2 | 0.21 | <0.2 | <0.2 | <0.2 | <0.2 | <1 (OG) |
| Iron (mg/L) | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 0.5 | <0.1 | <0.3 (AO) |
| Selenium (ICPMS) (µg/L) | 15.1 | 10.2 | 10.3 | 11.2 | 14.6 | 14.6 | 14.1 | <10 (MAC) |
| Uranium (ICPMS) (µg/L) | 49.9 | 37.5 | 38.6 | 39.0 | 46.6 | 46.6 | 45.2 | <20 (MAC) |

Consultant's notes: Please be advised that uranium and selenium have been detected at levels above their maximum allowable concentration (MAC) in the majority of samples collected from the Regway, SK site. The turbidity value has exceeded its operational guidance (OG) limit in the kitchen at the south trailer residence. Field staff were unable to access 1 of the residential sampling points (REGWAY-RESHS-KTC).

Consultant's recommendations: It is considered that, as the health-based objectives uranium and selenium exceed their MAC, the "Do not Drink" advisory which is already posted at the site should be reinforced with site personnel until the issues concerning these parameters are resolved. It was indicated in the field notes that bottled water is being used for drinking and food preparation. It is noted that previous chemical analysis results for the site also indicate that these parameters exceeded the MAC historically and may be naturally persistent in groundwater in the area. Treatment for these parameters using reverse osmosis may be possible.

Hayley's notes: Hayley will follow up with Connie to discuss the possibility of installing reverse osmosis treatment for Regway.

Wildhorse

| Sample Location | WILDHORSE_OFF_POE | WILDHORSE_OFF_KTC | WILDHORSE_OFF_RES-E-KTC | WILDHORSE_W-KTC |
|-----------------------------------|-------------------|-------------------|-------------------------|-----------------|
| Total Dissolved Solids (mg/L) | 2800 | 2700 | 2700 | |
| pH | 8.39 | 8.35 | 8.38 | |
| Total Cadmium (ug/L) | <0.10 | <0.10 | <0.10 | |
| Alkalinity (Total as CaCO3)(mg/L) | 300 | 310 | 310 | |
| Bicarbonate (mg/L) | 360 | 370 | 380 | |
| Carbonate (mg/L) | 2.8 | 1.6 | 2.3 | |

| | | | | |
|---------------------------------|-------------|-------------|-------------|--|
| Hydroxide (mg/L) | <0.50 | <0.50 | <0.50 | |
| Dissolved Sulphate (mg/L) | <1.0 | <1.0 | 1.5 | |
| Dissolved Chloride (mg/L) | 1600 | 1500 | 1500 | |
| E.Coli DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | |
| Total Coliforms DST (mpn/100mL) | <1.0 | <1.0 | <1.0 | |
| Turbidity | 0.35 | 0.28 | 0.17 | |
| Total Aluminum (mg/L) | <0.015 | <0.015 | <0.015 | |
| Total Antimony (mg/L) | <0.0030 | <0.0030 | <0.0030 | |
| Total Arsenic (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Barium (mg/L) | <0.010 | <0.010 | <0.010 | |
| Total Boron (mg/L) | 0.8 | 0.82 | 0.8 | |
| Total Calcium (mg/L) | 0.43 | 0.44 | 0.44 | |
| Total Chromium (mg/L) | <0.0050 | <0.0050 | <0.0050 | |
| Total Copper (mg/L) | 0.001 | 0.0049 | 0.0084 | |
| Total Iron (mg/L) | <0.060 | <0.060 | <0.060 | |
| Total Lead (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Lithium (mg/L) | 0.16 | 0.17 | 0.16 | |
| Total Magnesium (mg/L) | <0.20 | <0.20 | <0.20 | |
| Total Manganese(mg/L) | <0.0040 | <0.0040 | <0.0040 | |
| Total Phosphorus (mg/L) | <0.10 | <0.10 | <0.10 | |
| Total Potassium (mg/L) | 0.45 | 0.45 | 0.43 | |
| Total Selenium (mg/L) | <0.0010 | <0.0010 | <0.0010 | |
| Total Silicon (mg/L) | 2.8 | 2.9 | 2.8 | |
| Total Sodium (mg/L) | 1100 | 1100 | 1100 | |
| Total Strontium (mg/L) | <0.020 | <0.020 | <0.020 | |
| Total Sulphur (mg/L) | 0.27 | 0.32 | 0.39 | |
| Total Titanium (mg/L) | <0.0050 | <0.0050 | <0.0050 | |
| Total Uranium (mg/L) | <0.00050 | <0.00050 | <0.00050 | |
| Total Zinc (mg/L) | <0.015 | <0.015 | 0.016 | |
| Total Mercury (ug/L) | <0.0020 | <0.0020 | <0.0020 | |

Consultant's notes: Complete analytical results for the October 2014 monitoring round at Wild Horse indicated that no parameters exceeded their maximum allowable concentrations (MAC), however all samples exceeded their aesthetic objectives (AO) for total dissolved solids, chloride and sodium.

Consultant's recommendations: The exceedence of aesthetic objectives and operational guidance guidelines do not pose a health risk to site personnel, however they may affect the taste and odour of the water at the site which may prevent personnel consuming the water. It was indicated that bottled water is currently being used for drinking and food preparation at the site. As sodium could be a potential health issue for people on low-sodium diets, it is recommended that signage be put up to warn them of the issue. It is noted that the high concentrations of both sodium and chloride could potentially indicate a salt source such as road salt which may be preventable. No obvious sources were observed on site.

Hayley's notes: Hayley will follow up with Connie to discuss possible treatment options to eliminate total dissolved solids, chlorine, and sodium from the water.

If you would like to discuss these results or have any questions, please do not hesitate to contact me at any time.

Thank you,

Hayley

Hayley Proudfoot

Environmental Analyst | Analyste de l'environnement

Environmental Programs Division | Division des programmes environnementaux

Canada Border Services Agency | Agence des services frontaliers du Canada

427 Laurier Avenue West, 10th Floor | 427, avenue Laurier Ouest, 10e étage

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Telephone: (613) 960-9513

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Email : Hayley.Proudfoot@cbsa-asfc.gc.ca

Your Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Your C.O.C. #: A096302

Attention:ROBERT TILL

SLR CONSULTING (CANADA) LTD
6940 ROPER ROAD
EDMONTON, AB
CANADA T6B 3H9

Report Date: 2014/10/28

Report #: R1673239

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B495257

Received: 2014/10/21, 17:34

Sample Matrix: Water
Samples Received: 2

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|--|----------|-------------------|------------------|-----------------------------|----------------------|
| Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH | 2 | N/A | 2014/10/22 | AB SOP-00005 | SM 22 2320 B m |
| Cadmium - low level CCME (Total) | 2 | 2014/10/22 | 2014/10/28 | AB SOP-00014 / AB SOP-00043 | EPA 200.8 R5.4 m |
| Chloride by Automated Colourimetry | 2 | N/A | 2014/10/26 | AB SOP-00020 | SM 22-4500-Cl G m |
| Total Coliforms and E.Coli | 2 | 2014/10/22 | 2014/10/23 | CAL SOP-00013 | SM 22 9223 A,B m |
| Conductivity @25C | 2 | N/A | 2014/10/22 | AB SOP-00005 | SM 22 2510 B m |
| Hardness | 2 | N/A | 2014/10/28 | AB WI-00065 | SM 2340B |
| Elements by ICP-Dissolved-Lab Filtered | 2 | N/A | 2014/10/27 | AB SOP-00042 | EPA 200.7 CFR 2012 m |
| Elements by ICP - Total | 2 | 2014/10/25 | 2014/10/27 | AB SOP-00014 / AB SOP-00042 | EPA 200.7 CFR 2012 m |
| Elements by ICPMS - Total | 2 | 2014/10/25 | 2014/10/27 | AB SOP-00014 / AB SOP-00043 | EPA 200.8 R5.4 m |
| Ion Balance | 2 | N/A | 2014/10/22 | AB WI-00065 | SM 1030E |
| Sum of cations, anions | 2 | N/A | 2014/10/28 | AB WI-00065 | SM 1030E |
| Nitrate and Nitrite | 2 | N/A | 2014/10/28 | AB SOP-00023 | Auto Calc |
| Nitrate + Nitrite-N (calculated) | 2 | N/A | 2014/10/28 | AB SOP-00023 | SM 4110-B |
| Nitrogen, (Nitrite, Nitrate) by IC | 2 | N/A | 2014/10/27 | AB SOP-00023 | SM 22 4110 B m |
| pH @25°C (Alkalinity titrator) | 2 | N/A | 2014/10/22 | AB SOP-00005 | SM 22 4500-H+B m |
| Sulphate by Automated Colourimetry | 2 | N/A | 2014/10/26 | AB SOP-00018 | SM 22 4500-SO4 E m |
| Total Dissolved Solids (Calculated) | 2 | N/A | 2014/10/28 | AB WI-00065 | SM 1030E |
| Turbidity | 2 | N/A | 2014/10/22 | CAL SOP-00081 | SM 22 2130 B m |

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Your C.O.C. #: A096302

Attention:ROBERT TILL

SLR CONSULTING (CANADA) LTD
6940 ROPER ROAD
EDMONTON, AB
CANADA T6B 3H9

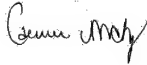
Report Date: 2014/10/28
Report #: R1673239
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B495257

Received: 2014/10/21, 17:34

Encryption Key



Carmen McKay

28 Oct 2014 16:59:32 -06:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Carmen McKay, Project Manager

Email: CMcKay@maxxam.ca

Phone# (403)219-3683

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B495257
Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Sampler Initials: BH

RESULTS OF CHEMICAL ANALYSES OF WATER

| | | | | | | |
|---|--------------|---------------------|-----------------|---------------------|------------|-----------------|
| Maxxam ID | | KX7222 | | KX7223 | | |
| Sampling Date | | 2014/10/21 11:45 | | 2014/10/21 12:10 | | |
| COC Number | | A096302 | | A096302 | | |
| | Units | 2D3A5 | QC Batch | 2D3A6 | RDL | QC Batch |
| Calculated Parameters | | | | | | |
| Anion Sum | meq/L | 20 | 7687640 | 20 | N/A | 7687640 |
| Cation Sum | meq/L | 20 | 7687640 | 20 | N/A | 7687640 |
| Hardness (CaCO ₃) | mg/L | 2.7 | 7687638 | 9.8 | 0.50 | 7687638 |
| Ion Balance | N/A | 0.98 | 7687639 | 0.99 | 0.010 | 7687639 |
| Dissolved Nitrate (NO ₃) | mg/L | <0.044 | 7687641 | <0.044 | 0.044 | 7687641 |
| Nitrate plus Nitrite (N) | mg/L | <0.010 | 7687642 | <0.010 | 0.010 | 7687642 |
| Dissolved Nitrite (NO ₂) | mg/L | <0.033 | 7687641 | <0.033 | 0.033 | 7687641 |
| Total Dissolved Solids | mg/L | 1200 | 7687643 | 1200 | 10 | 7687643 |
| Misc. Inorganics | | | | | | |
| Conductivity | uS/cm | 1900 | 7687894 | 1900 | 1.0 | 7687894 |
| pH | pH | 8.16 | 7687895 | 8.29 | N/A | 7687895 |
| Low Level Elements | | | | | | |
| Total Cadmium (Cd) | ug/L | <0.020 | 7687635 | <0.020 | 0.020 | 7687635 |
| Anions | | | | | | |
| Alkalinity (PP as CaCO ₃) | mg/L | <0.50 | 7687891 | <0.50 | 0.50 | 7687891 |
| Alkalinity (Total as CaCO ₃) | mg/L | 560 | 7687891 | 560 | 0.50 | 7687891 |
| Bicarbonate (HCO ₃) | mg/L | 690 | 7687891 | 690 | 0.50 | 7687891 |
| Carbonate (CO ₃) | mg/L | <0.50 | 7687891 | <0.50 | 0.50 | 7687891 |
| Hydroxide (OH) | mg/L | <0.50 | 7687891 | <0.50 | 0.50 | 7687891 |
| Dissolved Sulphate (SO ₄) | mg/L | 410 (1) | 7693787 | 410 (1) | 5.0 | 7693787 |
| Dissolved Chloride (Cl) | mg/L | 7.2 | 7693782 | 7.3 | 1.0 | 7693782 |
| Microbiological Param. | | | | | | |
| E.Coli DST | mpn/100mL | <1.0 | 7688197 | <1.0 | 1.0 | 7688197 |
| Total Coliforms DST | mpn/100mL | <1.0 | 7688197 | <1.0 | 1.0 | 7688197 |
| Nutrients | | | | | | |
| Dissolved Nitrite (N) | mg/L | <0.010 | 7688999 | <0.010 | 0.010 | 7688998 |
| Dissolved Nitrate (N) | mg/L | <0.010 | 7688999 | <0.010 | 0.010 | 7688998 |
| Physical Properties | | | | | | |
| Turbidity | NTU | <0.10 | 7687970 | 0.14 | 0.10 | 7687970 |
| RDL = Reportable Detection Limit N/A = Not Applicable (1) Detection limits raised due to dilution to bring analyte within the calibrated range. | | | | | | |

Maxxam Job #: B495257
Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Sampler Initials: BH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | KX7222 | KX7223 | | |
|----------------------------------|-------|---------------------|---------------------|---------|----------|
| Sampling Date | | 2014/10/21 11:45 | 2014/10/21 12:10 | | |
| COC Number | | A096302 | A096302 | | |
| | Units | 2D3A5 | 2D3A6 | RDL | QC Batch |
| Elements | | | | | |
| Total Aluminum (Al) | mg/L | 0.0064 | 0.011 | 0.0030 | 7692776 |
| Total Antimony (Sb) | mg/L | <0.00060 | <0.00060 | 0.00060 | 7692776 |
| Total Arsenic (As) | mg/L | <0.00020 | <0.00020 | 0.00020 | 7692776 |
| Total Barium (Ba) | mg/L | <0.010 | <0.010 | 0.010 | 7692778 |
| Total Beryllium (Be) | mg/L | <0.0010 | <0.0010 | 0.0010 | 7692776 |
| Total Boron (B) | mg/L | 0.28 | 0.28 | 0.020 | 7692778 |
| Total Calcium (Ca) | mg/L | 0.66 | 0.67 | 0.30 | 7692778 |
| Total Chromium (Cr) | mg/L | <0.0010 | <0.0010 | 0.0010 | 7692776 |
| Total Cobalt (Co) | mg/L | <0.00030 | <0.00030 | 0.00030 | 7692776 |
| Total Copper (Cu) | mg/L | 0.00034 | 0.0024 | 0.00020 | 7692776 |
| Total Iron (Fe) | mg/L | 0.11 | 0.086 | 0.060 | 7692778 |
| Total Lead (Pb) | mg/L | <0.00020 | <0.00020 | 0.00020 | 7692776 |
| Total Lithium (Li) | mg/L | <0.020 | 0.020 | 0.020 | 7692778 |
| Total Magnesium (Mg) | mg/L | 0.31 | 1.9 | 0.20 | 7692778 |
| Total Manganese (Mn) | mg/L | <0.0040 | 0.0069 | 0.0040 | 7692778 |
| Total Molybdenum (Mo) | mg/L | 0.0013 | 0.0013 | 0.00020 | 7692776 |
| Total Nickel (Ni) | mg/L | <0.00050 | <0.00050 | 0.00050 | 7692776 |
| Total Phosphorus (P) | mg/L | <0.10 | <0.10 | 0.10 | 7692778 |
| Total Potassium (K) | mg/L | 0.73 | 0.74 | 0.30 | 7692778 |
| Total Selenium (Se) | mg/L | <0.00020 | <0.00020 | 0.00020 | 7692776 |
| Total Silicon (Si) | mg/L | 7.4 | 7.1 | 0.10 | 7692778 |
| Total Silver (Ag) | mg/L | <0.00010 | <0.00010 | 0.00010 | 7692776 |
| Total Sodium (Na) | mg/L | 440 | 430 | 0.50 | 7692778 |
| Total Strontium (Sr) | mg/L | <0.020 | <0.020 | 0.020 | 7692778 |
| Total Sulphur (S) | mg/L | 140 | 130 | 0.20 | 7692778 |
| Total Thallium (Tl) | mg/L | <0.00020 | <0.00020 | 0.00020 | 7692776 |
| Total Tin (Sn) | mg/L | <0.0010 | <0.0010 | 0.0010 | 7692776 |
| Total Titanium (Ti) | mg/L | <0.0010 | <0.0010 | 0.0010 | 7692776 |
| Total Uranium (U) | mg/L | 0.00021 | 0.00019 | 0.00010 | 7692776 |
| Total Vanadium (V) | mg/L | <0.0010 | <0.0010 | 0.0010 | 7692776 |
| Total Zinc (Zn) | mg/L | 0.0030 | 0.0045 | 0.0030 | 7692776 |
| Lab Filtered Elements | | | | | |
| Dissolved Calcium (Ca) | mg/L | 0.63 | 0.65 | 0.30 | 7694558 |
| Dissolved Iron (Fe) | mg/L | 0.11 | 0.077 | 0.060 | 7694558 |
| RDL = Reportable Detection Limit | | | | | |



Success Through Science

Maxxam Job #: B495257
 Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
 Client Project #: 212.06498.00000
 Site Location: ADEN BORDER CROSSING AB
 Sampler Initials: BH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| | | | | | |
|--|--------------|---------------------|---------------------|------------|-----------------|
| Maxxam ID | | KX7222 | KX7223 | | |
| Sampling Date | | 2014/10/21 11:45 | 2014/10/21 12:10 | | |
| COC Number | | A096302 | A096302 | | |
| | Units | 2D3A5 | 2D3A6 | RDL | QC Batch |
| Dissolved Magnesium (Mg) | mg/L | 0.29 | 2.0 (1) | 0.20 | 7694558 |
| Dissolved Manganese (Mn) | mg/L | <0.0040 | 0.0068 | 0.0040 | 7694558 |
| Dissolved Potassium (K) | mg/L | 0.73 | 0.79 (2) | 0.30 | 7694558 |
| Dissolved Sodium (Na) | mg/L | 450 (1) | 450 (1) | 0.50 | 7694558 |
| RDL = Reportable Detection Limit | | | | | |
| (1) Dissolved greater than total. Results within acceptable limits of precision. | | | | | |
| (2) Dissolved greater than total. Results are within limits of uncertainty(MU). | | | | | |



Success Through Science

Maxxam Job #: B495257
Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Sampler Initials: BH

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|-----------|-------|
| Package 1 | 4.3°C |
|-----------|-------|

Results relate only to the items tested.

Maxxam Job #: B495257
Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Sampler Initials: BH

QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | Recovery | Units | QC Limits |
|-------------|------|--------------|--|---------------|--------|----------|-------|-----------|
| 7687891 | JLD | Spiked Blank | Alkalinity (Total as CaCO ₃) | 2014/10/22 | | 95 | % | 80 - 120 |
| 7687891 | JLD | Method Blank | Alkalinity (PP as CaCO ₃) | 2014/10/22 | <0.50 | | mg/L | |
| | | | Alkalinity (Total as CaCO ₃) | 2014/10/22 | <0.50 | | mg/L | |
| | | | Bicarbonate (HCO ₃) | 2014/10/22 | <0.50 | | mg/L | |
| | | | Carbonate (CO ₃) | 2014/10/22 | <0.50 | | mg/L | |
| | | | Hydroxide (OH) | 2014/10/22 | <0.50 | | mg/L | |
| 7687891 | JLD | RPD | Alkalinity (PP as CaCO ₃) | 2014/10/22 | NC | | % | 20 |
| | | | Alkalinity (Total as CaCO ₃) | 2014/10/22 | 0.85 | | % | 20 |
| | | | Bicarbonate (HCO ₃) | 2014/10/22 | 0.88 | | % | 20 |
| | | | Carbonate (CO ₃) | 2014/10/22 | NC | | % | 20 |
| | | | Hydroxide (OH) | 2014/10/22 | NC | | % | 20 |
| 7687894 | JLD | Spiked Blank | Conductivity | 2014/10/22 | | 100 | % | 90 - 110 |
| 7687894 | JLD | Method Blank | Conductivity | 2014/10/22 | <1.0 | | uS/cm | |
| 7687894 | JLD | RPD | Conductivity | 2014/10/22 | 0 | | % | 20 |
| 7687895 | JLD | Spiked Blank | pH | 2014/10/22 | | 100 | % | 97 - 103 |
| 7687895 | JLD | RPD | pH | 2014/10/22 | 1.0 | | % | N/A |
| 7687970 | HE1 | Spiked Blank | Turbidity | 2014/10/22 | | 98 | % | 80 - 120 |
| 7687970 | HE1 | Method Blank | Turbidity | 2014/10/22 | <0.10 | | NTU | |
| 7687970 | HE1 | RPD | Turbidity | 2014/10/22 | 4.8 | | % | 20 |
| 7688197 | MLC | RPD | E.Coli DST | 2014/10/23 | NC | | % | 100 |
| | | | Total Coliforms DST | 2014/10/23 | NC | | % | 100 |
| 7688988 | KSH | Matrix Spike | Dissolved Nitrite (N) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Dissolved Nitrate (N) | 2014/10/27 | | 100 | % | 80 - 120 |
| 7688988 | KSH | Spiked Blank | Dissolved Nitrite (N) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Dissolved Nitrate (N) | 2014/10/27 | | 100 | % | 80 - 120 |
| 7688988 | KSH | Method Blank | Dissolved Nitrite (N) | 2014/10/27 | <0.010 | | mg/L | |
| | | | Dissolved Nitrate (N) | 2014/10/27 | <0.010 | | mg/L | |
| 7688988 | KSH | RPD | Dissolved Nitrite (N) | 2014/10/27 | NC | | % | 20 |
| | | | Dissolved Nitrate (N) | 2014/10/27 | 0.49 | | % | 20 |
| 7688999 | KSH | Matrix Spike | Dissolved Nitrite (N) | 2014/10/27 | | 98 | % | 80 - 120 |
| | | | Dissolved Nitrate (N) | 2014/10/27 | | 98 | % | 80 - 120 |
| 7688999 | KSH | Spiked Blank | Dissolved Nitrite (N) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Dissolved Nitrate (N) | 2014/10/27 | | 97 | % | 80 - 120 |
| 7688999 | KSH | Method Blank | Dissolved Nitrite (N) | 2014/10/27 | <0.010 | | mg/L | |
| | | | Dissolved Nitrate (N) | 2014/10/27 | <0.010 | | mg/L | |
| 7688999 | KSH | RPD | Dissolved Nitrite (N) | 2014/10/27 | NC | | % | 20 |
| | | | Dissolved Nitrate (N) | 2014/10/27 | NC | | % | 20 |
| 7692776 | HC7 | Matrix Spike | Total Aluminum (Al) | 2014/10/27 | | 73 (1) | % | 80 - 120 |
| | | | Total Antimony (Sb) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Arsenic (As) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Total Beryllium (Be) | 2014/10/27 | | 98 | % | 80 - 120 |
| | | | Total Chromium (Cr) | 2014/10/27 | | 92 | % | 80 - 120 |
| | | | Total Cobalt (Co) | 2014/10/27 | | 90 | % | 80 - 120 |
| | | | Total Copper (Cu) | 2014/10/27 | | 86 | % | 80 - 120 |
| | | | Total Lead (Pb) | 2014/10/27 | | 89 | % | 80 - 120 |
| | | | Total Molybdenum (Mo) | 2014/10/27 | | 102 | % | 80 - 120 |
| | | | Total Nickel (Ni) | 2014/10/27 | | 87 | % | 80 - 120 |
| | | | Total Selenium (Se) | 2014/10/27 | | 92 | % | 80 - 120 |
| | | | Total Silver (Ag) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Thallium (Tl) | 2014/10/27 | | 91 | % | 80 - 120 |
| | | | Total Tin (Sn) | 2014/10/27 | | 101 | % | 80 - 120 |
| | | | Total Titanium (Ti) | 2014/10/27 | | 91 | % | 80 - 120 |

Maxxam Job #: B495257
Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Sampler Initials: BH

QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC | | | | Date | | | | |
|---------|------|--------------|-----------------------|------------|----------|----------|-------|-----------|
| Batch | Init | QC Type | Parameter | Analyzed | Value | Recovery | Units | QC Limits |
| 7692776 | HC7 | Spiked Blank | Total Uranium (U) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Vanadium (V) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Zinc (Zn) | 2014/10/27 | | 72 (1) | % | 80 - 120 |
| | | | Total Aluminum (Al) | 2014/10/27 | | 83 | % | 80 - 120 |
| | | | Total Antimony (Sb) | 2014/10/27 | | 102 | % | 80 - 120 |
| | | | Total Arsenic (As) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Beryllium (Be) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Chromium (Cr) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Cobalt (Co) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Copper (Cu) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Total Lead (Pb) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Total Molybdenum (Mo) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Nickel (Ni) | 2014/10/27 | | 93 | % | 80 - 120 |
| | | | Total Selenium (Se) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Silver (Ag) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Thallium (Tl) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Total Tin (Sn) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Titanium (Ti) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Uranium (U) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Vanadium (V) | 2014/10/27 | | 102 | % | 80 - 120 |
| 7692776 | HC7 | Method Blank | Total Zinc (Zn) | 2014/10/27 | | 93 | % | 80 - 120 |
| | | | Total Aluminum (Al) | 2014/10/27 | <0.0030 | | mg/L | |
| | | | Total Antimony (Sb) | 2014/10/27 | <0.00060 | | mg/L | |
| | | | Total Arsenic (As) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Beryllium (Be) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Chromium (Cr) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Cobalt (Co) | 2014/10/27 | <0.00030 | | mg/L | |
| | | | Total Copper (Cu) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Lead (Pb) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Molybdenum (Mo) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Nickel (Ni) | 2014/10/27 | <0.00050 | | mg/L | |
| | | | Total Selenium (Se) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Silver (Ag) | 2014/10/27 | <0.00010 | | mg/L | |
| | | | Total Thallium (Tl) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Tin (Sn) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Titanium (Ti) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Uranium (U) | 2014/10/27 | <0.00010 | | mg/L | |
| | | | Total Vanadium (V) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Zinc (Zn) | 2014/10/27 | <0.0030 | | mg/L | |
| 7692776 | HC7 | RPD | Total Aluminum (Al) | 2014/10/27 | NC | | % | 20 |
| | | | Total Antimony (Sb) | 2014/10/27 | NC | | % | 20 |
| | | | Total Arsenic (As) | 2014/10/27 | NC | | % | 20 |
| | | | Total Beryllium (Be) | 2014/10/27 | NC | | % | 20 |
| | | | Total Chromium (Cr) | 2014/10/27 | NC | | % | 20 |
| | | | Total Cobalt (Co) | 2014/10/27 | NC | | % | 20 |
| | | | Total Copper (Cu) | 2014/10/27 | NC | | % | 20 |
| | | | Total Lead (Pb) | 2014/10/27 | NC | | % | 20 |
| | | | Total Molybdenum (Mo) | 2014/10/27 | NC | | % | 20 |
| | | | Total Nickel (Ni) | 2014/10/27 | NC | | % | 20 |
| | | | Total Selenium (Se) | 2014/10/27 | NC | | % | 20 |
| | | | Total Silver (Ag) | 2014/10/27 | NC | | % | 20 |
| | | | Total Thallium (Tl) | 2014/10/27 | NC | | % | 20 |

Maxxam Job #: B495257
Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Sampler Initials: BH

QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC | | | | Date | | | | |
|---------|------|--------------|----------------------|------------|---------|----------|-------|-----------|
| Batch | Init | QC Type | Parameter | Analyzed | Value | Recovery | Units | QC Limits |
| 7692778 | MAP | Matrix Spike | Total Tin (Sn) | 2014/10/27 | NC | | % | 20 |
| | | | Total Titanium (Ti) | 2014/10/27 | NC | | % | 20 |
| | | | Total Uranium (U) | 2014/10/27 | NC | | % | 20 |
| | | | Total Vanadium (V) | 2014/10/27 | NC | | % | 20 |
| | | | Total Zinc (Zn) | 2014/10/27 | NC | | % | 20 |
| | | | Total Barium (Ba) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Boron (B) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Calcium (Ca) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Total Iron (Fe) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Total Lithium (Li) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Magnesium (Mg) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Total Manganese (Mn) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Phosphorus (P) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Potassium (K) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Silicon (Si) | 2014/10/27 | | NC | % | 80 - 120 |
| 7692778 | MAP | Spiked Blank | Total Sodium (Na) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Total Strontium (Sr) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Barium (Ba) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Boron (B) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Calcium (Ca) | 2014/10/27 | | 105 | % | 80 - 120 |
| | | | Total Iron (Fe) | 2014/10/27 | | 104 | % | 80 - 120 |
| | | | Total Lithium (Li) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Magnesium (Mg) | 2014/10/27 | | 98 | % | 80 - 120 |
| | | | Total Manganese (Mn) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Phosphorus (P) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Potassium (K) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Silicon (Si) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Sodium (Na) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Strontium (Sr) | 2014/10/27 | | 99 | % | 80 - 120 |
| 7692778 | MAP | Method Blank | Total Barium (Ba) | 2014/10/27 | <0.010 | | mg/L | |
| | | | Total Boron (B) | 2014/10/27 | <0.020 | | mg/L | |
| | | | Total Calcium (Ca) | 2014/10/27 | <0.30 | | mg/L | |
| | | | Total Iron (Fe) | 2014/10/27 | <0.060 | | mg/L | |
| | | | Total Lithium (Li) | 2014/10/27 | <0.020 | | mg/L | |
| | | | Total Magnesium (Mg) | 2014/10/27 | <0.20 | | mg/L | |
| | | | Total Manganese (Mn) | 2014/10/27 | <0.0040 | | mg/L | |
| | | | Total Phosphorus (P) | 2014/10/27 | <0.10 | | mg/L | |
| | | | Total Potassium (K) | 2014/10/27 | <0.30 | | mg/L | |
| | | | Total Silicon (Si) | 2014/10/27 | <0.10 | | mg/L | |
| | | | Total Sodium (Na) | 2014/10/27 | <0.50 | | mg/L | |
| | | | Total Strontium (Sr) | 2014/10/27 | <0.020 | | mg/L | |
| | | | Total Sulphur (S) | 2014/10/27 | <0.20 | | mg/L | |
| 7692778 | MAP | RPD | Total Barium (Ba) | 2014/10/27 | 2.9 | | % | 20 |
| | | | Total Boron (B) | 2014/10/27 | 2.0 | | % | 20 |
| | | | Total Calcium (Ca) | 2014/10/27 | 2.1 | | % | 20 |
| | | | Total Iron (Fe) | 2014/10/27 | 0.30 | | % | 20 |
| | | | Total Lithium (Li) | 2014/10/27 | NC | | % | 20 |
| | | | Total Magnesium (Mg) | 2014/10/27 | 2.4 | | % | 20 |
| | | | Total Manganese (Mn) | 2014/10/27 | 2.3 | | % | 20 |
| | | | Total Phosphorus (P) | 2014/10/27 | NC | | % | 20 |
| | | | Total Potassium (K) | 2014/10/27 | 3.4 | | % | 20 |
| | | | Total Silicon (Si) | 2014/10/27 | 2.8 | | % | 20 |

Maxxam Job #: B495257
Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Sampler Initials: BH

QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | Recovery | Units | QC Limits |
|-------------|------|--------------|--------------------------|---------------|---------|----------|-------|-----------|
| 7693782 | KP9 | Matrix Spike | Total Sodium (Na) | 2014/10/27 | 3.4 | | % | 20 |
| | | | Total Strontium (Sr) | 2014/10/27 | 2.8 | | % | 20 |
| | | | Total Sulphur (S) | 2014/10/27 | 2.8 | | % | 20 |
| | | | Dissolved Chloride (Cl) | 2014/10/26 | | 105 | % | 80 - 120 |
| | | | Dissolved Chloride (Cl) | 2014/10/26 | | 104 | % | 80 - 120 |
| | | | Dissolved Chloride (Cl) | 2014/10/26 | <1.0 | | mg/L | |
| | | | Dissolved Chloride (Cl) | 2014/10/26 | NC | | % | 20 |
| | | | Dissolved Sulphate (SO4) | 2014/10/26 | | 105 | % | 80 - 120 |
| | | | Dissolved Sulphate (SO4) | 2014/10/26 | | 105 | % | 80 - 120 |
| | | | Dissolved Sulphate (SO4) | 2014/10/26 | <1.0 | | mg/L | |
| 7694558 | MAP | Matrix Spike | Dissolved Sulphate (SO4) | 2014/10/26 | NC | | % | 20 |
| | | | Dissolved Calcium (Ca) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Dissolved Iron (Fe) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Dissolved Magnesium (Mg) | 2014/10/27 | | 87 | % | 80 - 120 |
| | | | Dissolved Manganese (Mn) | 2014/10/27 | | 88 | % | 80 - 120 |
| | | | Dissolved Potassium (K) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Dissolved Sodium (Na) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Dissolved Calcium (Ca) | 2014/10/27 | | 103 | % | 80 - 120 |
| | | | Dissolved Iron (Fe) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Dissolved Magnesium (Mg) | 2014/10/27 | | 98 | % | 80 - 120 |
| 7694558 | MAP | Spiked Blank | Dissolved Manganese (Mn) | 2014/10/27 | | 98 | % | 80 - 120 |
| | | | Dissolved Potassium (K) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Dissolved Sodium (Na) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Dissolved Calcium (Ca) | 2014/10/27 | <0.30 | | mg/L | |
| | | | Dissolved Iron (Fe) | 2014/10/27 | <0.060 | | mg/L | |
| | | | Dissolved Magnesium (Mg) | 2014/10/27 | <0.20 | | mg/L | |
| | | | Dissolved Manganese (Mn) | 2014/10/27 | <0.0040 | | mg/L | |
| | | | Dissolved Potassium (K) | 2014/10/27 | <0.30 | | mg/L | |
| | | | Dissolved Sodium (Na) | 2014/10/27 | <0.50 | | mg/L | |
| | | | Dissolved Calcium (Ca) | 2014/10/27 | 0.028 | | % | 20 |
| 7694558 | MAP | RPD | Dissolved Magnesium (Mg) | 2014/10/27 | 0.59 | | % | 20 |
| | | | Dissolved Potassium (K) | 2014/10/27 | 0.12 | | % | 20 |
| | | | Dissolved Sodium (Na) | 2014/10/27 | 0.43 | | % | 20 |
| | | | Dissolved Calcium (Ca) | 2014/10/27 | 0.43 | | % | 20 |

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



Success Through Science

Maxxam Job #: B495257
Report Date: 2014/10/28

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: ADEN BORDER CROSSING AB
Sampler Initials: BH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Peng Liang, Analyst II

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



City: 4055 19th St. NE, P.O. Box 100, Portland, OR 97208
Tel: (503) 281-3077, Fax: (503) 236-0240, Toll free: (800) 356-7247
Email: info@maxxam.com
www.maxxam.com

Chain of Custody

Page: 1 of 1

Company: SLR Consulting Ltd
Contact: Robert T. II
Address: 6940 Lamar Rd., EDM
City: AB
Prov: T663H9
Contact #: 720-81-0881

Report To: Same as Invoice
Prov: PO:
City: CA:

Report Distribution (E-Mail):
rt.ill@slrconsulting.com

REGULATORY GUIDELINES:
☐ AT1
☐ CCME
☒ Regulated Drinking Water
☐ Other: COWR

PO #: 06489, 00000
Project # / Name: 2120049
Site Location: Aden Border Crossing, AB
Quote #: 840366
Sampled By: SHC

SERVICE REQUESTED:
☐ RUSH (Contact lab to reserve)
Date Required:
☒ REGULAR (5 to 7 Days)

| | Sample ID | Depth (unit) | Matrix GW / SW Soil | Date/Time Sampled YY/MM/DD 24:00 | BTEX P | Sieve (75 micron) | Regulation | Salinity | Assessment | Basic C | UBTEX | UBTEX | TOC | Total Dissolved | Residual | Tot. C | Tot. N | Reg. T | Res. T | HOLD |
|----|-----------|--------------|---------------------|----------------------------------|--------|-------------------|------------|----------|------------|---------|-------|-------|-----|-----------------|----------|--------|--------|--------|--------|------|
| 1 | 2D3A5 | | GW | 14/10/21 11:45 | | | | | | | | | | | | X | X | X | 0" | |
| 2 | 2D3A6 | | L | 12:10 | | | | | | | | | | | | X | X | X | 6" | |
| 3 | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | | | | |

21-Oct-14 17:34

Wendy Sears

11 10 1

21-Oct-14 17:34
Wendy Sears
B495257
JLX
JMH INS-0040

Please indicate Filtered, Preserved or Both (F, P, F/P)
Relinquished By (Signature/Print): [Signature] Date (YY/MM/DD): 14/10/21 Time (24:00): 17:32
Relinquished By (Signature/Print): [Signature] Date (YY/MM/DD): [Blank] Time (24:00): [Blank]
Special Instructions: COWR guidelines
of Jars Used & Not Submitted: [Blank]

LAB USE ONLY
Received By: [Signature] Date: 2014/10/21 Time: 17:34
Maxxam Job #: [Blank]
Copy: [Blank] Temp: 6.7
Lab Comments: [Blank]

AB PCD-0013 Rev 2010/06

Maxxam Analytics International Corporation or Maxxam Analytics

Your Project #: 212.06498.00000
Site Location: DEL BONITA, AB
Your C.O.C. #: A096456

Attention:ROBERT TILL

SLR CONSULTING (CANADA) LTD
6940 ROPER ROAD
EDMONTON, AB
CANADA T6B 3H9

Report Date: 2014/10/27
Report #: R1672202
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B495672

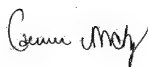
Received: 2014/10/22, 15:21

Sample Matrix: Water
Samples Received: 3

| Analyses | Quantity | Date | Date | Laboratory Method | Analytical Method |
|----------------------------|----------|------------|------------|-------------------|-------------------|
| | | Extracted | Analyzed | | |
| Total Coliforms and E.Coli | 3 | 2014/10/22 | 2014/10/23 | CAL SOP-00013 | SM 22 9223 A,B m |
| Turbidity | 3 | N/A | 2014/10/23 | CAL SOP-00081 | SM 22 2130 B m |

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key



Carmen McKay

28 Oct 2014 16:43:03 -06:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Carmen McKay, Project Manager

Email: CMcKay@maxxam.ca

Phone# (403)219-3683

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Success Through Science

Maxxam Job #: B495672
 Report Date: 2014/10/27

SLR CONSULTING (CANADA) LTD
 Client Project #: 212.06498.00000
 Site Location: DEL BONITA, AB
 Sampler Initials: BHP

RESULTS OF CHEMICAL ANALYSES OF WATER

| | | | | | | |
|----------------------------------|--------------|---------------------|---------------------|---------------------|------------|-----------------|
| Maxxam ID | | KX9363 | KX9364 | KX9365 | | |
| Sampling Date | | 2014/10/22 09:35 | 2014/10/22 09:55 | 2014/10/22 10:15 | | |
| COC Number | | A096456 | A096456 | A096456 | | |
| | Units | 2D3CE | 2D3CF | 2D3CD | RDL | QC Batch |
| Microbiological Param. | | | | | | |
| E.Coli DST | mpn/100mL | <1.0 | <1.0 | <1.0 | 1.0 | 7688197 |
| Total Coliforms DST | mpn/100mL | <1.0 | <1.0 | <1.0 | 1.0 | 7688197 |
| Physical Properties | | | | | | |
| Turbidity | NTU | <0.10 | <0.10 | <0.10 | 0.10 | 7690295 |
| RDL = Reportable Detection Limit | | | | | | |



Success Through Science

Maxxam Job #: B495672
Report Date: 2014/10/27

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: DEL BONITA, AB
Sampler Initials: BHP

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|-----------|-------|
| Package 1 | 2.7°C |
|-----------|-------|

Results relate only to the items tested.



Success Through Science

Maxxam Job #: B495672
 Report Date: 2014/10/27

SLR CONSULTING (CANADA) LTD
 Client Project #: 212.06498.00000
 Site Location: DEL BONITA, AB
 Sampler Initials: BHP

QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | Recovery | Units | QC Limits |
|----------------|------|-----------------|---------------------|------------------|-------|----------|-------|-----------|
| 7688197 | MLC | RPD | E.Coli DST | 2014/10/23 | NC | | % | 100 |
| | | | Total Coliforms DST | 2014/10/23 | NC | | % | 100 |
| 7690295 | KKV | Spiked Blank | Turbidity | 2014/10/23 | | 98 | % | 80 - 120 |
| 7690295 | KKV | Method Blank | Turbidity | 2014/10/23 | <0.10 | | NTU | |
| 7690295 | KKV | RPD [KX9363-02] | Turbidity | 2014/10/23 | NC | | % | 20 |

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).



Success Through Science

Maxxam Job #: B495672
Report Date: 2014/10/27

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: DEL BONITA, AB
Sampler Initials: BHP

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Michelle Fritz Gatehouse, Senior Analyst

Peng Liang, Analyst II

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Your Project #: 212.06498.00000
Site Location: CBSA WATER SAMPLING
Your C.O.C. #: C#452223-01-01

Attention:ROBERT TILL

SLR CONSULTING (CANADA) LTD
6940 ROPER ROAD
EDMONTON, AB
CANADA T6B 3H9

Report Date: 2014/10/31
Report #: R1675069
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B497994


Received: 2014/10/28, 16:00

Sample Matrix: Water
Samples Received: 4

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|-----------------------------------|----------|-------------------|------------------|-------------------|-------------------|
| Coliforms by Colilert Quanti-tray | 4 | N/A | 2014/10/28 | WIN SOP-00004 | Coliforms (QT/CL) |
| Turbidity | 4 | N/A | 2014/10/29 | WIN SOP-00024 | Based on SM-2130B |

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

 Janelle Kochan
31 Oct 2014 13:48:34 -05:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Janelle Kochan, B.Sc., Project Manager

Email: JKochan@maxxam.ca

Phone# (204)772-7276 Ext:2209

=====

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Success Through Science

Maxxam Job #: B497994
 Report Date: 2014/10/31

SLR CONSULTING (CANADA) LTD
 Client Project #: 212.06498.00000
 Site Location: CBSA WATER SAMPLING
 Sampler Initials: PO

RESULTS OF CHEMICAL ANALYSES OF WATER

| Maxxam ID | | KZ6374 | KZ6375 | KZ6376 | KZ6377 | | |
|----------------------------------|-------|---------------------|---------------------|---------------------|---------------------|-----|----------|
| Sampling Date | | 2014/10/28 09:52 | 2014/10/28 09:20 | 2014/10/28 09:30 | 2014/10/28 09:47 | | |
| COC Number | | C#452223-01-01 | C#452223-01-01 | C#452223-01-01 | C#452223-01-01 | | |
| | Units | 2D3D9 | 2D3DA | 2E8E7 | 2E8E6 | RDL | QC Batch |
| Physical Properties | | | | | | | |
| Turbidity | NTU | 1.2 | 0.6 | <0.1 | 0.2 | 0.1 | 7699362 |
| RDL = Reportable Detection Limit | | | | | | | |

Maxxam Job #: B497994
Report Date: 2014/10/31

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: CBSA WATER SAMPLING
Sampler Initials: PO

MICROBIOLOGY (WATER)

| Maxxam ID | | KZ6374 | KZ6375 | KZ6376 | KZ6377 | |
|-------------------------------|-----------|---------------------|---------------------|---------------------|---------------------|----------|
| Sampling Date | | 2014/10/28 09:52 | 2014/10/28 09:20 | 2014/10/28 09:30 | 2014/10/28 09:47 | |
| COC Number | | C#452223-01-01 | C#452223-01-01 | C#452223-01-01 | C#452223-01-01 | |
| | Units | 2D3D9 | 2D3DA | 2E8E7 | 2E8E6 | QC Batch |
| Microbiological Param. | | | | | | |
| E. coli (QT) | MPN/100mL | 0 | 0 | 0 | 0 | 7698487 |
| Total Coliforms (QT) | MPN/100mL | 0 | 0 | 0 | 0 | 7698487 |



Success Through Science

Maxxam Job #: B497994
Report Date: 2014/10/31

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: CBSA WATER SAMPLING
Sampler Initials: PO

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|-----------|-------|
| Package 1 | 3.8°C |
|-----------|-------|

Results relate only to the items tested.



Success Through Science

Maxxam Job #: B497994
 Report Date: 2014/10/31

SLR CONSULTING (CANADA) LTD
 Client Project #: 212.06498.00000
 Site Location: CBSA WATER SAMPLING
 Sampler Initials: PO

QUALITY ASSURANCE REPORT

| QA/QC | | | | | Date | | | | |
|---|------|--------------|-----------|--|------------|-------|----------|-------|-----------|
| Batch | Init | QC Type | Parameter | | Analyzed | Value | Recovery | Units | QC Limits |
| 7699362 | HPA | Method Blank | Turbidity | | 2014/10/29 | <0.1 | | NTU | |
| 7699362 | HPA | RPD | Turbidity | | 2014/10/29 | 0.41 | | % | 20 |
| Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement. | | | | | | | | | |
| Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination. | | | | | | | | | |




Success Through Science

Maxxam Job #: B497994
Report Date: 2014/10/31

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.00000
Site Location: CBISA WATER SAMPLING
Sampler Initials: PO

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Erin Santos, Dip. Chemical and Biosciences, Laboratory Coordinator



Rob Reinert, Data Validation Coordinator

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



**Saskatchewan
Ministry of
Health**

**Saskatchewan Disease Control Laboratory
Environmental Services**

<http://www.health.gov.sk.ca/lab>

5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 1059875
Sample Location: Regway - Rests - Ktc
Collected by: Gary Milton

PO #: 21206498000

Collected: 23-Oct-2014 11:25 AM
Received: 23-Oct-2014 2:40 PM
Reported: 28-Oct-2014 11:52 AM
Water Source: Water (Other)

Submitted By:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

Invoice:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

| Analysis | Result | Unit | Sask Guideline | Test Comment | Fee |
|------------------|---------------|-------------|----------------|--------------|-------|
| Iron | 0.1 | mg/L | | | 10.50 |
| Magnesium | 117 | mg/L | | | 10.50 |
| Selenium (ICPMS) | 15.1 | µg/L | | | 21.00 |
| Uranium (ICPMS) | 49.9 | µg/L | | | 10.50 |
| GUDI Panel | | | | | 31.50 |
| Total Coliform | No Detectable | orgs/100 mL | No orgs/100 mL | 1 | |
| E. Coli | No Detectable | orgs/100 mL | No orgs/100 mL | 2 | |
| Turbidity | 1.4 | N.T.U. | < 1 | | |

Submitter Phone Number: 306-525-4690

Emailed results to: tcossette@slrconsulting.com

Comments:

1. Testing result indicates that your water meets the Bacteriological standard for Canadian drinking water quality.
2. See above for comment

Please include
Invoice Number
with payment
and remit to:

**Minister of Finance
Saskatchewan Health
3475 Albert Street
Regina, Saskatchewan
S4S 6X6**

Total Fees (including GST) 84.00

Tax Summary 4.00
G.S.T. (reg # 107864258)

Amount Received: (No Payment Received) 0.00

Balance Due upon receipt of invoice.

| | |
|---------------------|----------------|
| Balance Owed | \$84.00 |
|---------------------|----------------|

Contact Us:

Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Toll Free: 1-866-450-0000, Phone: (306) 787-7138, Fax: (306) 798-0046, Email: info@health.gov.sk.ca



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<http://www.health.gov.sk.ca/lab>

5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 1059874 **PO #:** 21206498000 **Collected:** 23-Oct-2014 10:50 AM
Sample Location: Regway - Off - Ktc **Received:** 23-Oct-2014 2:40 PM
Collected by: Gary Milton **Reported:** 28-Oct-2014 11:52 AM
Water Source: Water (Other)

Submitted By:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

Invoice:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

| Analysis | Result | Unit | Sask Guideline | Test Comment | Fee |
|------------------|---------------|-------------|----------------|--------------|-------|
| Iron | <0.1 | mg/L | | | 10.50 |
| Magnesium | 102 | mg/L | | | 10.50 |
| Selenium (ICPMS) | 10.2 | µg/L | | | 21.00 |
| Uranium (ICPMS) | 37.5 | µg/L | | | 10.50 |
| GUDI Panel | | | | | 31.50 |
| Total Coliform | No Detectable | orgs/100 mL | No orgs/100 mL | 1 | |
| E. Coli | No Detectable | orgs/100 mL | No orgs/100 mL | 2 | |
| Turbidity | <0.20 | N.T.U. | < 1 | | |

Submitter Phone Number: 306-525-4690

Emailed results to: tcossette@slrconsulting.com

Comments:

1. Testing result indicates that your water meets the Bacteriological standard for Canadian drinking water quality.
2. See above for comment

Please include
Invoice Number
with payment
and remit to:

**Minister of Finance
Saskatchewan Health
3475 Albert Street
Regina, Saskatchewan
S4S 6X6**

Total Fees (including GST) 84.00

Tax Summary 4.00
G.S.T. (reg # 107864258)

Amount Received: (No Payment Received) 0.00

Balance Due upon receipt of invoice.

| | |
|---------------------|----------------|
| Balance Owed | \$84.00 |
|---------------------|----------------|

Contact Us:

Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Toll Free: 1-866-450-0000, Phone: (306) 787-7138, Fax: (306) 798-0046, Email: info@health.gov.sk.ca



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5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 1059873
Sample Location: Regway - Off - WAS - Pob
Collected by: Gary Milton

PO #: 21206498000

Collected: 23-Oct-2014 10:20 AM
Received: 23-Oct-2014 2:39 PM
Reported: 28-Oct-2014 11:52 AM
Water Source: Water (Other)

Submitted By:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

Invoice:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

| Analysis | Result | Unit | Sask Guideline | Test Comment | Fee |
|------------------|---------------|-------------|----------------|--------------|-------|
| Iron | <0.1 | mg/L | | | 10.50 |
| Magnesium | 105 | mg/L | | | 10.50 |
| Selenium (ICPMS) | 11.2 | µg/L | | | 21.00 |
| Uranium (ICPMS) | 39.0 | µg/L | | | 10.50 |
| GUDI Panel | | | | | 31.50 |
| Total Coliform | No Detectable | orgs/100 mL | No orgs/100 mL | 1 | |
| E. Coli | No Detectable | orgs/100 mL | No orgs/100 mL | 2 | |
| Turbidity | <0.20 | N.T.U. | < 1 | | |

Submitter Phone Number: 306-525-4690

Emailed results to: tcossette@slrconsulting.com

Comments:

1. Testing result indicates that your water meets the Bacteriological standard for Canadian drinking water quality.
2. See above for comment

Please include
Invoice Number
with payment
and remit to:

**Minister of Finance
Saskatchewan Health
3475 Albert Street
Regina, Saskatchewan
S4S 6X6**

Total Fees (including GST) 84.00

Tax Summary 4.00
G.S.T. (reg # 107864258)

Amount Received: (No Payment Received) 0.00

Balance Due upon receipt of invoice.

| | |
|---------------------|----------------|
| Balance Owed | \$84.00 |
|---------------------|----------------|

Contact Us:

Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Toll Free: 1-866-450-0000, Phone: (306) 787-7138, Fax: (306) 798-0046, Email: info@health.gov.sk.ca



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5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 1059872
Sample Location: Regway - Res HN - Ktc
Collected by: Gary Milton

PO #: 21206498000

Collected: 23-Oct-2014 10:50 AM
Received: 23-Oct-2014 2:38 PM
Reported: 28-Oct-2014 11:52 AM
Water Source: Water (Other)

Submitted By:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

Invoice:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

| Analysis | Result | Unit | Sask Guideline | Test Comment | Fee |
|------------------|---------------|-------------|----------------|--------------|-------|
| Iron | <0.1 | mg/L | | | 10.50 |
| Magnesium | <1 | mg/L | | | 10.50 |
| Selenium (ICPMS) | 14.6 | µg/L | | | 21.00 |
| Uranium (ICPMS) | 44.4 | µg/L | | | 10.50 |
| GUDI Panel | | | | | 31.50 |
| Total Coliform | No Detectable | orgs/100 mL | No orgs/100 mL | 1 | |
| E. Coli | No Detectable | orgs/100 mL | No orgs/100 mL | 2 | |
| Turbidity | <0.20 | N.T.U. | < 1 | | |

Submitter Phone Number: 306-525-4690

Emailed results to: tcossette@slrconsulting.com

Comments:

1. Testing result indicates that your water meets the Bacteriological standard for Canadian drinking water quality.
2. See above for comment

Please include
Invoice Number
with payment
and remit to:

**Minister of Finance
Saskatchewan Health
3475 Albert Street
Regina, Saskatchewan
S4S 6X6**

Total Fees (including GST) 84.00

Tax Summary 4.00
G.S.T. (reg # 107864258)

Amount Received: (No Payment Received) 0.00

Balance Due upon receipt of invoice.

| | |
|---------------------|----------------|
| Balance Owed | \$84.00 |
|---------------------|----------------|

Contact Us:

Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Toll Free: 1-866-450-0000, Phone: (306) 787-7138, Fax: (306) 798-0046, Email: info@health.gov.sk.ca



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5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 1059870 **PO #:** 21206498000 **Collected:** 23-Oct-2014 10:40 AM
Sample Location: Regway - Off - FP **Received:** 23-Oct-2014 2:21 PM
Collected by: Gary Milton **Reported:** 28-Oct-2014 11:51 AM
Water Source: Water (Other)

Submitted By:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

Invoice:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

| Analysis | Result | Unit | Sask Guideline | Test Comment | Fee |
|------------------|---------------|-------------|----------------|--------------|-------|
| Iron | <0.1 | mg/L | | | 10.50 |
| Magnesium | 103 | mg/L | | | 10.50 |
| Selenium (ICPMS) | 10.3 | µg/L | | | 21.00 |
| Uranium (ICPMS) | 38.6 | µg/L | | | 10.50 |
| GUDI Panel | | | | | 31.50 |
| Total Coliform | No Detectable | orgs/100 mL | No orgs/100 mL | 1 | |
| E. Coli | No Detectable | orgs/100 mL | No orgs/100 mL | 2 | |
| Turbidity | .21 | N.T.U. | < 1 | | |

Submitter Phone Number: 306-525-4690

Emailed results to: tcossette@slrconsulting.com

Comments:

1. Testing result indicates that your water meets the Bacteriological standard for Canadian drinking water quality.
2. See above for comment

Please include
Invoice Number
with payment
and remit to:

**Minister of Finance
Saskatchewan Health
3475 Albert Street
Regina, Saskatchewan
S4S 6X6**

Total Fees (including GST) 84.00

Tax Summary 4.00
G.S.T. (reg # 107864258)

Amount Received: (No Payment Received) 0.00

Balance Due upon receipt of invoice.

| | |
|---------------------|----------------|
| Balance Owed | \$84.00 |
|---------------------|----------------|

Contact Us:

Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Toll Free: 1-866-450-0000, Phone: (306) 787-7138, Fax: (306) 798-0046, Email: info@health.gov.sk.ca



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Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 1059871 **PO #:** 21206498000 **Collected:** 23-Oct-2014 10:30 AM
Sample Location: Regway - Off - Poe **Received:** 23-Oct-2014 2:37 PM
Collected by: Gary Milton **Reported:** 28-Oct-2014 11:52 AM
Water Source: Water (Other)

Submitted By:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

Invoice:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

| Analysis | Result | Unit | Sask Guideline | Test Comment | Fee |
|------------------|---------------|-------------|----------------|--------------|-------|
| Iron | 0.5 | mg/L | | | 10.50 |
| Magnesium | 112 | mg/L | | | 10.50 |
| Selenium (ICPMS) | 14.6 | µg/L | | | 21.00 |
| Uranium (ICPMS) | 46.6 | µg/L | | | 10.50 |
| GUDI Panel | | | | | 31.50 |
| Total Coliform | No Detectable | orgs/100 mL | No orgs/100 mL | 1 | |
| E. Coli | No Detectable | orgs/100 mL | No orgs/100 mL | 2 | |
| Turbidity | <0.20 | N.T.U. | < 1 | | |

Submitter Phone Number: 306-525-4690

Emailed results to: tcossette@slrconsulting.com

Comments:

1. Testing result indicates that your water meets the Bacteriological standard for Canadian drinking water quality.
2. See above for comment

Please include
Invoice Number
with payment
and remit to:

**Minister of Finance
Saskatchewan Health
3475 Albert Street
Regina, Saskatchewan
S4S 6X6**

Total Fees (including GST) 84.00

Tax Summary 4.00
G.S.T. (reg # 107864258)

Amount Received: (No Payment Received) 0.00

Balance Due upon receipt of invoice.

| | |
|---------------------|----------------|
| Balance Owed | \$84.00 |
|---------------------|----------------|

Contact Us:

Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Toll Free: 1-866-450-0000, Phone: (306) 787-7138, Fax: (306) 798-0046, Email: info@health.gov.sk.ca



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Environmental Services**

<http://www.health.gov.sk.ca/lab>

5 Research Drive
Regina, Saskatchewan
S4S 0A4

(306) 787-7138 / (306) 787-3140

Environmental Services Analysis Report - Final

Invoice Number: 1059876
Sample Location: Regway - Reshm - Ktc
Collected by: Gary Milton

PO #: 21206498000

Collected: 23-Oct-2014 11:15 AM
Received: 23-Oct-2014 2:41 PM
Reported: 28-Oct-2014 11:53 AM
Water Source: Water (Other)

Submitted By:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

Invoice:

SLR CONSULTING
1048 WINNIPEG STREET
REGINA, SK
S4R 8P8

| Analysis | Result | Unit | Sask Guideline | Test Comment | Fee |
|------------------|---------------|-------------|----------------|--------------|-------|
| Iron | <0.1 | mg/L | | | 10.50 |
| Magnesium | <1 | mg/L | | | 10.50 |
| Selenium (ICPMS) | 14.1 | µg/L | | | 21.00 |
| Uranium (ICPMS) | 45.2 | µg/L | | | 10.50 |
| GUDI Panel | | | | | 31.50 |
| Total Coliform | No Detectable | orgs/100 mL | No orgs/100 mL | 1 | |
| E. Coli | No Detectable | orgs/100 mL | No orgs/100 mL | 2 | |
| Turbidity | <0.20 | N.T.U. | < 1 | | |

Submitter Phone Number: 306-525-4690

Emailed results to: tcossette@slrconsulting.com

Comments:

1. Testing result indicates that your water meets the Bacteriological standard for Canadian drinking water quality.
2. See above for comment

Please include
Invoice Number
with payment
and remit to:

**Minister of Finance
Saskatchewan Health
3475 Albert Street
Regina, Saskatchewan
S4S 6X6**

Total Fees (including GST) 84.00

Tax Summary 4.00
G.S.T. (reg # 107864258)

Amount Received: (No Payment Received) 0.00

Balance Due upon receipt of invoice.

| | |
|---------------------|----------------|
| Balance Owed | \$84.00 |
|---------------------|----------------|

Contact Us:

Result Interpretation: Please contact your Regina Qu'Appelle Public Health Officer at: (306) 766-7705
Billing Inquiries: Toll Free: 1-866-450-0000, Phone: (306) 787-7138, Fax: (306) 798-0046, Email: info@health.gov.sk.ca

Your Project #: 212.06498.0000
Site Location: WILD HORSE BORDER CROSSING, AB
Your C.O.C. #: A096474

Attention: ROBERT TILL

SLR CONSULTING (CANADA) LTD
6940 ROPER ROAD
EDMONTON, AB
CANADA T6B 3H9

Report Date: 2014/10/29
Report #: R1673945
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B495234

Received: 2014/10/21, 17:31

Sample Matrix: Water
Samples Received: 4

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|--|-----------------|---------------------------|--------------------------|-----------------------------|--------------------------|
| Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH | 4 | N/A | 2014/10/23 | AB SOP-00005 | SM 22 2320 B m |
| Cadmium - low level CCME (Total) | 4 | 2014/10/21 | 2014/10/28 | AB SOP-00014 / AB SOP-00043 | EPA 200.8 R5.4 m |
| Chloride by Automated Colourimetry | 4 | N/A | 2014/10/26 | AB SOP-00020 | SM 22-4500-Cl G m |
| Total Coliforms and E.Coli | 4 | 2014/10/22 | 2014/10/23 | CAL SOP-00013 | SM 22 9223 A,B m |
| Conductivity @25C | 4 | N/A | 2014/10/23 | AB SOP-00005 | SM 22 2510 B m |
| Hardness | 4 | N/A | 2014/10/28 | AB WI-00065 | SM 2340B |
| Mercury - Low Level (Total) | 4 | 2014/10/28 | 2014/10/28 | CAL SOP-00007 | EPA 1631 RE 20460 m |
| Elements by ICP-Dissolved-Lab Filtered | 4 | N/A | 2014/10/27 | AB SOP-00042 | EPA 200.7 CFR 2012 m |
| Elements by ICP - Total | 4 | 2014/10/25 | 2014/10/27 | AB SOP-00014 / AB SOP-00042 | EPA 200.7 CFR 2012 m |
| Elements by ICPMS - Total | 4 | 2014/10/25 | 2014/10/27 | AB SOP-00014 / AB SOP-00043 | EPA 200.8 R5.4 m |
| Ion Balance | 4 | N/A | 2014/10/22 | AB WI-00065 | SM 1030E |
| Sum of cations, anions | 4 | N/A | 2014/10/28 | AB WI-00065 | SM 1030E |
| Nitrate and Nitrite | 1 | N/A | 2014/10/24 | AB SOP-00023 | Auto Calc |
| Nitrate and Nitrite | 3 | N/A | 2014/10/27 | AB SOP-00023 | Auto Calc |
| Nitrate + Nitrite-N (calculated) | 1 | N/A | 2014/10/24 | AB SOP-00023 | SM 4110-B |
| Nitrate + Nitrite-N (calculated) | 3 | N/A | 2014/10/27 | AB SOP-00023 | SM 4110-B |
| Nitrogen, (Nitrite, Nitrate) by IC | 4 | N/A | 2014/10/24 | AB SOP-00023 | SM 22 4110 B m |
| pH @25°C (Alkalinity titrator) | 4 | N/A | 2014/10/23 | AB SOP-00005 | SM 22 4500-H+B m |
| Sulphate by Automated Colourimetry | 4 | N/A | 2014/10/26 | AB SOP-00018 | SM 22 4500-SO4 E m |
| Total Dissolved Solids (Calculated) | 4 | N/A | 2014/10/28 | AB WI-00065 | SM 1030E |
| Turbidity | 4 | N/A | 2014/10/22 | CAL SOP-00081 | SM 22 2130 B m |

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: 212.06498.0000
Site Location: WILD HORSE BORDER CROSSING, AB
Your C.O.C. #: A096474

Attention:ROBERT TILL
SLR CONSULTING (CANADA) LTD
6940 ROPER ROAD
EDMONTON, AB
CANADA T6B 3H9

Report Date: 2014/10/29
Report #: R1673945
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B495234
Received: 2014/10/21, 17:31

Encryption Key



Alina Kenstavicius
29 Oct 2014 16:48:15 -06:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Carmen McKay, Project Manager
Email: CMcKay@maxxam.ca
Phone# (403)219-3683

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B495234
Report Date: 2014/10/29

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.0000
Site Location: WILD HORSE BORDER CROSSING, AB
Sampler Initials: BHP

RESULTS OF CHEMICAL ANALYSES OF WATER

| Maxxam ID | | KX7064 | | KX7065 | KX7066 | KX7067 | | |
|---|-----------|---------------------|----------|---------------------|---------------------|---------------------|-------|----------|
| Sampling Date | | 2014/10/21 08:35 | | 2014/10/21 08:15 | 2014/10/21 08:55 | 2014/10/21 09:15 | | |
| COC Number | | A096474 | | A096474 | A096474 | A096474 | | |
| | Units | 2D414 | QC Batch | 2D413 | 2D416 | 2D417 | RDL | QC Batch |
| Calculated Parameters | | | | | | | | |
| Anion Sum | meq/L | 50 | 7687415 | 50 | 49 | 49 | N/A | 7687415 |
| Cation Sum | meq/L | 43 | 7687415 | 48 | 42 | 48 | N/A | 7687415 |
| Hardness (CaCO ₃) | mg/L | 1.7 | 7687411 | 1.0 | 1.1 | 1.3 | 0.50 | 7687411 |
| Ion Balance | N/A | 0.87 | 7687413 | 0.95 | 0.86 | 0.96 | 0.010 | 7687413 |
| Dissolved Nitrate (NO ₃) | mg/L | <0.044 | 7687417 | <0.044 | <0.044 | <0.044 | 0.044 | 7687417 |
| Nitrate plus Nitrite (N) | mg/L | <0.010 | 7687419 | <0.010 | <0.010 | <0.010 | 0.010 | 7687419 |
| Dissolved Nitrite (NO ₂) | mg/L | <0.033 | 7687417 | <0.033 | <0.033 | <0.033 | 0.033 | 7687417 |
| Total Dissolved Solids | mg/L | 2700 | 7687421 | 2800 | 2700 | 2800 | 10 | 7687421 |
| Misc. Inorganics | | | | | | | | |
| Conductivity | uS/cm | 5400 | 7688387 | 5400 | 5400 | 5500 | 1.0 | 7688387 |
| pH | pH | 8.35 | 7688388 | 8.39 | 8.38 | 8.07 | N/A | 7688388 |
| Low Level Elements | | | | | | | | |
| Total Cadmium (Cd) | ug/L | <0.10 | 7687407 | <0.10 | <0.10 | <0.10 | 0.10 | 7687407 |
| Anions | | | | | | | | |
| Alkalinity (PP as CaCO ₃) | mg/L | 1.3 | 7688382 | 2.3 | 1.9 | <0.50 | 0.50 | 7688382 |
| Alkalinity (Total as CaCO ₃) | mg/L | 310 | 7688382 | 300 | 310 | 180 | 0.50 | 7688382 |
| Bicarbonate (HCO ₃) | mg/L | 370 | 7688382 | 360 | 380 | 210 | 0.50 | 7688382 |
| Carbonate (CO ₃) | mg/L | 1.6 | 7688382 | 2.8 | 2.3 | <0.50 | 0.50 | 7688382 |
| Hydroxide (OH) | mg/L | <0.50 | 7688382 | <0.50 | <0.50 | <0.50 | 0.50 | 7688382 |
| Dissolved Sulphate (SO ₄) | mg/L | <1.0 | 7693787 | <1.0 | 1.5 | <1.0 | 1.0 | 7693787 |
| Dissolved Chloride (Cl) | mg/L | 1500 (1) | 7693782 | 1600 (1) | 1500 (1) | 1600 (1) | 10 | 7693782 |
| Microbiological Param. | | | | | | | | |
| E.Coli DST | mpn/100mL | <1.0 | 7688197 | <1.0 | <1.0 | <1.0 | 1.0 | 7688197 |
| Total Coliforms DST | mpn/100mL | <1.0 | 7688197 | <1.0 | <1.0 | <1.0 | 1.0 | 7688197 |
| Nutrients | | | | | | | | |
| Dissolved Nitrite (N) | mg/L | <0.010 | 7689539 | <0.010 | <0.010 | <0.010 | 0.010 | 7689539 |
| Dissolved Nitrate (N) | mg/L | <0.010 | 7689539 | <0.010 | <0.010 | <0.010 | 0.010 | 7689539 |
| Physical Properties | | | | | | | | |
| Turbidity | NTU | 0.28 | 7687970 | 0.35 | 0.17 | 0.26 | 0.10 | 7687970 |
| RDL = Reportable Detection Limit N/A = Not Applicable (1) Detection limits raised due to dilution to bring analyte within the calibrated range. | | | | | | | | |

Maxxam Job #: B495234
Report Date: 2014/10/29

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.0000
Site Location: WILD HORSE BORDER CROSSING, AB
Sampler Initials: BHP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | KX7064 | | KX7065 | | KX7066 | | KX7067 | | |
|---------------|-------|---------------------|----------|---------------------|----------|---------------------|----------|---------------------|-----|----------|
| Sampling Date | | 2014/10/21 08:35 | | 2014/10/21 08:15 | | 2014/10/21 08:55 | | 2014/10/21 09:15 | | |
| COC Number | | A096474 | | A096474 | | A096474 | | A096474 | | |
| | Units | 2D414 | QC Batch | 2D413 | QC Batch | 2D416 | QC Batch | 2D417 | RDL | QC Batch |

| Elements | | | | | | | | | | |
|-----------------------|------|----------|---------|----------|---------|----------|---------|----------|---------|---------|
| Total Aluminum (Al) | mg/L | <0.015 | 7692776 | <0.015 | 7692776 | <0.015 | 7692776 | <0.015 | 0.015 | 7692776 |
| Total Antimony (Sb) | mg/L | <0.0030 | 7692776 | <0.0030 | 7692776 | <0.0030 | 7692776 | <0.0030 | 0.0030 | 7692776 |
| Total Arsenic (As) | mg/L | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 0.0010 | 7692776 |
| Total Barium (Ba) | mg/L | <0.010 | 7692778 | <0.010 | 7692778 | <0.010 | 7692778 | <0.010 | 0.010 | 7692778 |
| Total Beryllium (Be) | mg/L | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 0.0050 | 7692776 |
| Total Boron (B) | mg/L | 0.82 | 7692778 | 0.80 | 7692778 | 0.80 | 7692778 | 0.82 | 0.020 | 7692778 |
| Total Calcium (Ca) | mg/L | 0.44 | 7692778 | 0.43 | 7692778 | 0.44 | 7692778 | 0.56 | 0.30 | 7692778 |
| Total Chromium (Cr) | mg/L | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 0.0050 | 7692776 |
| Total Cobalt (Co) | mg/L | <0.0015 | 7692776 | <0.0015 | 7692776 | <0.0015 | 7692776 | <0.0015 | 0.0015 | 7692776 |
| Total Copper (Cu) | mg/L | 0.0049 | 7692776 | 0.0010 | 7692776 | 0.0084 | 7692776 | 0.024 | 0.0010 | 7692776 |
| Total Iron (Fe) | mg/L | <0.060 | 7692778 | <0.060 | 7692778 | <0.060 | 7692778 | <0.060 | 0.060 | 7692778 |
| Total Lead (Pb) | mg/L | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 0.0010 | 7692776 |
| Total Lithium (Li) | mg/L | 0.17 | 7692778 | 0.16 | 7692778 | 0.16 | 7692778 | 0.083 | 0.020 | 7692778 |
| Total Magnesium (Mg) | mg/L | <0.20 | 7692778 | <0.20 | 7692778 | <0.20 | 7692778 | <0.20 | 0.20 | 7692778 |
| Total Manganese (Mn) | mg/L | <0.0040 | 7692778 | <0.0040 | 7692778 | <0.0040 | 7692778 | <0.0040 | 0.0040 | 7692778 |
| Total Molybdenum (Mo) | mg/L | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 0.0010 | 7692776 |
| Total Nickel (Ni) | mg/L | <0.0025 | 7692776 | <0.0025 | 7692776 | <0.0025 | 7692776 | <0.0025 | 0.0025 | 7692776 |
| Total Phosphorus (P) | mg/L | <0.10 | 7692778 | <0.10 | 7692778 | <0.10 | 7692778 | <0.10 | 0.10 | 7692778 |
| Total Potassium (K) | mg/L | 0.45 | 7692778 | 0.45 | 7692778 | 0.43 | 7692778 | 0.59 | 0.30 | 7692778 |
| Total Selenium (Se) | mg/L | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 0.0010 | 7692776 |
| Total Silicon (Si) | mg/L | 2.9 | 7692778 | 2.8 | 7692778 | 2.8 | 7692778 | 3.1 | 0.10 | 7692778 |
| Total Silver (Ag) | mg/L | <0.00050 | 7692776 | <0.00050 | 7692776 | <0.00050 | 7692776 | <0.00050 | 0.00050 | 7692776 |
| Total Sodium (Na) | mg/L | 1100 (1) | 7692778 | 1100 (1) | 7692778 | 1100 (1) | 7692778 | 1100 (1) | 2.5 | 7692778 |
| Total Strontium (Sr) | mg/L | <0.020 | 7692778 | <0.020 | 7692778 | <0.020 | 7692778 | <0.020 | 0.020 | 7692778 |
| Total Sulphur (S) | mg/L | 0.32 | 7692778 | 0.27 | 7692778 | 0.39 | 7692778 | 0.29 | 0.20 | 7692778 |
| Total Thallium (Tl) | mg/L | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 7692776 | <0.0010 | 0.0010 | 7692776 |
| Total Tin (Sn) | mg/L | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 0.0050 | 7692776 |
| Total Titanium (Ti) | mg/L | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 0.0050 | 7692776 |
| Total Uranium (U) | mg/L | <0.00050 | 7692776 | <0.00050 | 7692776 | <0.00050 | 7692776 | <0.00050 | 0.00050 | 7692776 |
| Total Vanadium (V) | mg/L | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 7692776 | <0.0050 | 0.0050 | 7692776 |
| Total Zinc (Zn) | mg/L | <0.015 | 7692776 | <0.015 | 7692776 | 0.016 | 7692776 | <0.015 | 0.015 | 7692776 |

RDL = Reportable Detection Limit

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B495234
Report Date: 2014/10/29

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.0000
Site Location: WILD HORSE BORDER CROSSING, AB
Sampler Initials: BHP

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

| Maxxam ID | | KX7064 | | KX7065 | | KX7066 | | KX7067 | | |
|---------------|-------|---------------------|----------|---------------------|----------|---------------------|----------|---------------------|-----|----------|
| Sampling Date | | 2014/10/21 08:35 | | 2014/10/21 08:15 | | 2014/10/21 08:55 | | 2014/10/21 09:15 | | |
| COC Number | | A096474 | | A096474 | | A096474 | | A096474 | | |
| | Units | 2D414 | QC Batch | 2D413 | QC Batch | 2D416 | QC Batch | 2D417 | RDL | QC Batch |

| Lab Filtered Elements | | | | | | | | | | |
|--------------------------|------|----------|---------|----------|---------|---------|---------|----------|--------|---------|
| Dissolved Calcium (Ca) | mg/L | 0.66 (1) | 7694558 | 0.40 | 7698248 | 0.43 | 7694558 | 0.53 | 0.30 | 7698248 |
| Dissolved Iron (Fe) | mg/L | <0.060 | 7694558 | <0.060 | 7694558 | <0.060 | 7694558 | <0.060 | 0.060 | 7694558 |
| Dissolved Magnesium (Mg) | mg/L | <0.20 | 7694558 | <0.20 | 7698248 | <0.20 | 7694558 | <0.20 | 0.20 | 7698248 |
| Dissolved Manganese (Mn) | mg/L | <0.0040 | 7694558 | <0.0040 | 7694558 | <0.0040 | 7694558 | <0.0040 | 0.0040 | 7694558 |
| Dissolved Potassium (K) | mg/L | 0.38 | 7694558 | 0.47 | 7698248 | 0.38 | 7694558 | 0.53 | 0.30 | 7698248 |
| Dissolved Sodium (Na) | mg/L | 990 (2) | 7694558 | 1100 (2) | 7698248 | 960 (2) | 7694558 | 1100 (2) | 2.5 | 7698248 |

| Low Level Elements | | | | | | | | | | |
|--------------------|------|---------|---------|---------|---------|---------|---------|---------|--------|---------|
| Total Mercury (Hg) | ug/L | <0.0020 | 7696493 | <0.0020 | 7696493 | <0.0020 | 7696493 | <0.0020 | 0.0020 | 7696493 |

RDL = Reportable Detection Limit

- (1) Dissolved greater than total. Results are within limits of uncertainty(MU).
(2) Detection limits raised due to dilution to bring analyte within the calibrated range.



Success Through Science

Maxxam Job #: B495234
 Report Date: 2014/10/29

SLR CONSULTING (CANADA) LTD
 Client Project #: 212.06498.0000
 Site Location: WILD HORSE BORDER CROSSING, AB
 Sampler Initials: BHP

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|-----------|--------|
| Package 1 | -0.3°C |
|-----------|--------|

Sample KX7064-01 : Cation - Anion balance investigated, data quality confirmed.

Sample KX7066-01 : Cation - Anion balance investigated, data quality confirmed.

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER) Comments

Sample KX7064-03 Elements by ICPMS - Total: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Sample KX7065-03 Elements by ICPMS - Total: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Sample KX7066-03 Elements by ICPMS - Total: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Sample KX7067-03 Elements by ICPMS - Total: Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly

Sample KX7065, Elements by ICP-Dissolved-Lab Filtered: Test repeated.

Sample KX7067, Elements by ICP-Dissolved-Lab Filtered: Test repeated.

Results relate only to the items tested.

Maxxam Job #: B495234
Report Date: 2014/10/29

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.0000
Site Location: WILD HORSE BORDER CROSSING, AB
Sampler Initials: BHP

QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | Recovery | Units | QC Limits |
|-------------|------|-----------------|--|---------------|--------|----------|-------|-----------|
| 7687970 | HE1 | Spiked Blank | Turbidity | 2014/10/22 | | 98 | % | 80 - 120 |
| 7687970 | HE1 | Method Blank | Turbidity | 2014/10/22 | <0.10 | | NTU | |
| 7687970 | HE1 | RPD | Turbidity | 2014/10/22 | 4.8 | | % | 20 |
| 7688197 | MLC | RPD [KX7064-05] | E.Coli DST | 2014/10/23 | NC | | % | 100 |
| | | | Total Coliforms DST | 2014/10/23 | NC | | % | 100 |
| 7688382 | JLD | Spiked Blank | Alkalinity (Total as CaCO ₃) | 2014/10/23 | | 96 | % | 80 - 120 |
| 7688382 | JLD | Method Blank | Alkalinity (PP as CaCO ₃) | 2014/10/23 | <0.50 | | mg/L | |
| | | | Alkalinity (Total as CaCO ₃) | 2014/10/23 | <0.50 | | mg/L | |
| | | | Bicarbonate (HCO ₃) | 2014/10/23 | <0.50 | | mg/L | |
| | | | Carbonate (CO ₃) | 2014/10/23 | <0.50 | | mg/L | |
| | | | Hydroxide (OH) | 2014/10/23 | <0.50 | | mg/L | |
| 7688382 | JLD | RPD | Alkalinity (PP as CaCO ₃) | 2014/10/23 | NC | | % | 20 |
| | | | Alkalinity (Total as CaCO ₃) | 2014/10/23 | 1.7 | | % | 20 |
| | | | Bicarbonate (HCO ₃) | 2014/10/23 | 1.7 | | % | 20 |
| | | | Carbonate (CO ₃) | 2014/10/23 | NC | | % | 20 |
| | | | Hydroxide (OH) | 2014/10/23 | NC | | % | 20 |
| 7688387 | JLD | Spiked Blank | Conductivity | 2014/10/23 | | 102 | % | 90 - 110 |
| 7688387 | JLD | Method Blank | Conductivity | 2014/10/23 | <1.0 | | uS/cm | |
| 7688387 | JLD | RPD | Conductivity | 2014/10/23 | 2.4 | | % | 20 |
| 7688388 | JLD | Spiked Blank | pH | 2014/10/23 | | 100 | % | 97 - 103 |
| 7688388 | JLD | RPD | pH | 2014/10/23 | 0.56 | | % | N/A |
| 7689539 | KSH | Matrix Spike | Dissolved Nitrite (N) | 2014/10/24 | | 99 | % | 80 - 120 |
| | | | Dissolved Nitrate (N) | 2014/10/24 | | NC | % | 80 - 120 |
| 7689539 | KSH | Spiked Blank | Dissolved Nitrite (N) | 2014/10/24 | | 101 | % | 80 - 120 |
| | | | Dissolved Nitrate (N) | 2014/10/24 | | 102 | % | 80 - 120 |
| 7689539 | KSH | Method Blank | Dissolved Nitrite (N) | 2014/10/24 | <0.010 | | mg/L | |
| | | | Dissolved Nitrate (N) | 2014/10/24 | <0.010 | | mg/L | |
| 7689539 | KSH | RPD | Dissolved Nitrite (N) | 2014/10/24 | NC | | % | 20 |
| | | | Dissolved Nitrate (N) | 2014/10/24 | 0.082 | | % | 20 |
| 7689573 | LQ1 | Matrix Spike | Dissolved Nitrite (N) | 2014/10/24 | | 99 | % | 80 - 120 |
| | | | Dissolved Nitrate (N) | 2014/10/24 | | 98 | % | 80 - 120 |
| 7689573 | LQ1 | Spiked Blank | Dissolved Nitrite (N) | 2014/10/24 | | 98 | % | 80 - 120 |
| | | | Dissolved Nitrate (N) | 2014/10/24 | | 98 | % | 80 - 120 |
| 7689573 | LQ1 | Method Blank | Dissolved Nitrite (N) | 2014/10/24 | <0.010 | | mg/L | |
| | | | Dissolved Nitrate (N) | 2014/10/24 | <0.010 | | mg/L | |
| 7689573 | LQ1 | RPD | Dissolved Nitrite (N) | 2014/10/24 | NC | | % | 20 |
| | | | Dissolved Nitrate (N) | 2014/10/24 | NC | | % | 20 |
| 7692776 | HC7 | Matrix Spike | Total Aluminum (Al) | 2014/10/27 | | 73 (1) | % | 80 - 120 |
| | | | Total Antimony (Sb) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Arsenic (As) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Total Beryllium (Be) | 2014/10/27 | | 98 | % | 80 - 120 |
| | | | Total Chromium (Cr) | 2014/10/27 | | 92 | % | 80 - 120 |
| | | | Total Cobalt (Co) | 2014/10/27 | | 90 | % | 80 - 120 |
| | | | Total Copper (Cu) | 2014/10/27 | | 86 | % | 80 - 120 |
| | | | Total Lead (Pb) | 2014/10/27 | | 89 | % | 80 - 120 |
| | | | Total Molybdenum (Mo) | 2014/10/27 | | 102 | % | 80 - 120 |
| | | | Total Nickel (Ni) | 2014/10/27 | | 87 | % | 80 - 120 |
| | | | Total Selenium (Se) | 2014/10/27 | | 92 | % | 80 - 120 |
| | | | Total Silver (Ag) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Thallium (Tl) | 2014/10/27 | | 91 | % | 80 - 120 |
| | | | Total Tin (Sn) | 2014/10/27 | | 101 | % | 80 - 120 |
| | | | Total Titanium (Ti) | 2014/10/27 | | 91 | % | 80 - 120 |

Maxxam Job #: B495234
Report Date: 2014/10/29

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.0000
Site Location: WILD HORSE BORDER CROSSING, AB
Sampler Initials: BHP

QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC | | | | Date | | | | |
|---------|------|--------------|-----------------------|------------|----------|----------|-------|-----------|
| Batch | Init | QC Type | Parameter | Analyzed | Value | Recovery | Units | QC Limits |
| 7692776 | HC7 | Spiked Blank | Total Uranium (U) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Vanadium (V) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Zinc (Zn) | 2014/10/27 | | 72 (1) | % | 80 - 120 |
| | | | Total Aluminum (Al) | 2014/10/27 | | 83 | % | 80 - 120 |
| | | | Total Antimony (Sb) | 2014/10/27 | | 102 | % | 80 - 120 |
| | | | Total Arsenic (As) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Beryllium (Be) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Chromium (Cr) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Cobalt (Co) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Copper (Cu) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Total Lead (Pb) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Total Molybdenum (Mo) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Nickel (Ni) | 2014/10/27 | | 93 | % | 80 - 120 |
| | | | Total Selenium (Se) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Silver (Ag) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Thallium (Tl) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Total Tin (Sn) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Titanium (Ti) | 2014/10/27 | | 95 | % | 80 - 120 |
| | | | Total Uranium (U) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Vanadium (V) | 2014/10/27 | | 102 | % | 80 - 120 |
| 7692776 | HC7 | Method Blank | Total Zinc (Zn) | 2014/10/27 | | 93 | % | 80 - 120 |
| | | | Total Aluminum (Al) | 2014/10/27 | <0.0030 | | mg/L | |
| | | | Total Antimony (Sb) | 2014/10/27 | <0.00060 | | mg/L | |
| | | | Total Arsenic (As) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Beryllium (Be) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Chromium (Cr) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Cobalt (Co) | 2014/10/27 | <0.00030 | | mg/L | |
| | | | Total Copper (Cu) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Lead (Pb) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Molybdenum (Mo) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Nickel (Ni) | 2014/10/27 | <0.00050 | | mg/L | |
| | | | Total Selenium (Se) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Silver (Ag) | 2014/10/27 | <0.00010 | | mg/L | |
| | | | Total Thallium (Tl) | 2014/10/27 | <0.00020 | | mg/L | |
| | | | Total Tin (Sn) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Titanium (Ti) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Uranium (U) | 2014/10/27 | <0.00010 | | mg/L | |
| | | | Total Vanadium (V) | 2014/10/27 | <0.0010 | | mg/L | |
| | | | Total Zinc (Zn) | 2014/10/27 | <0.0030 | | mg/L | |
| 7692776 | HC7 | RPD | Total Aluminum (Al) | 2014/10/27 | NC | | % | 20 |
| | | | Total Antimony (Sb) | 2014/10/27 | NC | | % | 20 |
| | | | Total Arsenic (As) | 2014/10/27 | NC | | % | 20 |
| | | | Total Beryllium (Be) | 2014/10/27 | NC | | % | 20 |
| | | | Total Chromium (Cr) | 2014/10/27 | NC | | % | 20 |
| | | | Total Cobalt (Co) | 2014/10/27 | NC | | % | 20 |
| | | | Total Copper (Cu) | 2014/10/27 | NC | | % | 20 |
| | | | Total Lead (Pb) | 2014/10/27 | NC | | % | 20 |
| | | | Total Molybdenum (Mo) | 2014/10/27 | NC | | % | 20 |
| | | | Total Nickel (Ni) | 2014/10/27 | NC | | % | 20 |
| | | | Total Selenium (Se) | 2014/10/27 | NC | | % | 20 |
| | | | Total Silver (Ag) | 2014/10/27 | NC | | % | 20 |
| | | | Total Thallium (Tl) | 2014/10/27 | NC | | % | 20 |

Maxxam Job #: B495234
Report Date: 2014/10/29

SLR CONSULTING (CANADA) LTD
Client Project #: 212.06498.0000
Site Location: WILD HORSE BORDER CROSSING, AB
Sampler Initials: BHP

QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | Recovery | Units | QC Limits |
|----------------|------|--------------|----------------------|------------------|---------|----------|-------|-----------|
| 7692778 | MAP | Matrix Spike | Total Tin (Sn) | 2014/10/27 | NC | | % | 20 |
| | | | Total Titanium (Ti) | 2014/10/27 | NC | | % | 20 |
| | | | Total Uranium (U) | 2014/10/27 | NC | | % | 20 |
| | | | Total Vanadium (V) | 2014/10/27 | NC | | % | 20 |
| | | | Total Zinc (Zn) | 2014/10/27 | NC | | % | 20 |
| | | | Total Barium (Ba) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Boron (B) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Calcium (Ca) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Total Iron (Fe) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Total Lithium (Li) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Magnesium (Mg) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Total Manganese (Mn) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Phosphorus (P) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Potassium (K) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Silicon (Si) | 2014/10/27 | | NC | % | 80 - 120 |
| 7692778 | MAP | Spiked Blank | Total Sodium (Na) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Total Strontium (Sr) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Barium (Ba) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Boron (B) | 2014/10/27 | | 96 | % | 80 - 120 |
| | | | Total Calcium (Ca) | 2014/10/27 | | 105 | % | 80 - 120 |
| | | | Total Iron (Fe) | 2014/10/27 | | 104 | % | 80 - 120 |
| | | | Total Lithium (Li) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Magnesium (Mg) | 2014/10/27 | | 98 | % | 80 - 120 |
| | | | Total Manganese (Mn) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Phosphorus (P) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Potassium (K) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Total Silicon (Si) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Total Sodium (Na) | 2014/10/27 | | 97 | % | 80 - 120 |
| | | | Total Strontium (Sr) | 2014/10/27 | | 99 | % | 80 - 120 |
| 7692778 | MAP | Method Blank | Total Barium (Ba) | 2014/10/27 | <0.010 | | mg/L | |
| | | | Total Boron (B) | 2014/10/27 | <0.020 | | mg/L | |
| | | | Total Calcium (Ca) | 2014/10/27 | <0.30 | | mg/L | |
| | | | Total Iron (Fe) | 2014/10/27 | <0.060 | | mg/L | |
| | | | Total Lithium (Li) | 2014/10/27 | <0.020 | | mg/L | |
| | | | Total Magnesium (Mg) | 2014/10/27 | <0.20 | | mg/L | |
| | | | Total Manganese (Mn) | 2014/10/27 | <0.0040 | | mg/L | |
| | | | Total Phosphorus (P) | 2014/10/27 | <0.10 | | mg/L | |
| | | | Total Potassium (K) | 2014/10/27 | <0.30 | | mg/L | |
| | | | Total Silicon (Si) | 2014/10/27 | <0.10 | | mg/L | |
| | | | Total Sodium (Na) | 2014/10/27 | <0.50 | | mg/L | |
| | | | Total Strontium (Sr) | 2014/10/27 | <0.020 | | mg/L | |
| | | | Total Sulphur (S) | 2014/10/27 | <0.20 | | mg/L | |
| 7692778 | MAP | RPD | Total Barium (Ba) | 2014/10/27 | 2.9 | | % | 20 |
| | | | Total Boron (B) | 2014/10/27 | 2.0 | | % | 20 |
| | | | Total Calcium (Ca) | 2014/10/27 | 2.1 | | % | 20 |
| | | | Total Iron (Fe) | 2014/10/27 | 0.30 | | % | 20 |
| | | | Total Lithium (Li) | 2014/10/27 | NC | | % | 20 |
| | | | Total Magnesium (Mg) | 2014/10/27 | 2.4 | | % | 20 |
| | | | Total Manganese (Mn) | 2014/10/27 | 2.3 | | % | 20 |
| | | | Total Phosphorus (P) | 2014/10/27 | NC | | % | 20 |
| | | | Total Potassium (K) | 2014/10/27 | 3.4 | | % | 20 |
| | | | Total Silicon (Si) | 2014/10/27 | 2.8 | | % | 20 |

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Sampler Initials: BHP

QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC | | | | Date | | | | |
|---------|------|--------------|--------------------------|------------|---------|----------|-------|-----------|
| Batch | Init | QC Type | Parameter | Analyzed | Value | Recovery | Units | QC Limits |
| | | | Total Sodium (Na) | 2014/10/27 | 3.4 | | % | 20 |
| | | | Total Strontium (Sr) | 2014/10/27 | 2.8 | | % | 20 |
| | | | Total Sulphur (S) | 2014/10/27 | 2.8 | | % | 20 |
| 7693782 | KP9 | Matrix Spike | Dissolved Chloride (Cl) | 2014/10/26 | | 105 | % | 80 - 120 |
| 7693782 | KP9 | Spiked Blank | Dissolved Chloride (Cl) | 2014/10/26 | | 104 | % | 80 - 120 |
| 7693782 | KP9 | Method Blank | Dissolved Chloride (Cl) | 2014/10/26 | <1.0 | | mg/L | |
| 7693782 | KP9 | RPD | Dissolved Chloride (Cl) | 2014/10/26 | NC | | % | 20 |
| 7693787 | KP9 | Matrix Spike | Dissolved Sulphate (SO4) | 2014/10/26 | | 105 | % | 80 - 120 |
| 7693787 | KP9 | Spiked Blank | Dissolved Sulphate (SO4) | 2014/10/26 | | 105 | % | 80 - 120 |
| 7693787 | KP9 | Method Blank | Dissolved Sulphate (SO4) | 2014/10/26 | <1.0 | | mg/L | |
| 7693787 | KP9 | RPD | Dissolved Sulphate (SO4) | 2014/10/26 | NC | | % | 20 |
| 7694558 | MAP | Matrix Spike | Dissolved Calcium (Ca) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Dissolved Iron (Fe) | 2014/10/27 | | 94 | % | 80 - 120 |
| | | | Dissolved Magnesium (Mg) | 2014/10/27 | | 87 | % | 80 - 120 |
| | | | Dissolved Manganese (Mn) | 2014/10/27 | | 88 | % | 80 - 120 |
| | | | Dissolved Potassium (K) | 2014/10/27 | | NC | % | 80 - 120 |
| | | | Dissolved Sodium (Na) | 2014/10/27 | | NC | % | 80 - 120 |
| 7694558 | MAP | Spiked Blank | Dissolved Calcium (Ca) | 2014/10/27 | | 103 | % | 80 - 120 |
| | | | Dissolved Iron (Fe) | 2014/10/27 | | 100 | % | 80 - 120 |
| | | | Dissolved Magnesium (Mg) | 2014/10/27 | | 98 | % | 80 - 120 |
| | | | Dissolved Manganese (Mn) | 2014/10/27 | | 98 | % | 80 - 120 |
| | | | Dissolved Potassium (K) | 2014/10/27 | | 99 | % | 80 - 120 |
| | | | Dissolved Sodium (Na) | 2014/10/27 | | 95 | % | 80 - 120 |
| 7694558 | MAP | Method Blank | Dissolved Calcium (Ca) | 2014/10/27 | <0.30 | | mg/L | |
| | | | Dissolved Iron (Fe) | 2014/10/27 | <0.060 | | mg/L | |
| | | | Dissolved Magnesium (Mg) | 2014/10/27 | <0.20 | | mg/L | |
| | | | Dissolved Manganese (Mn) | 2014/10/27 | <0.0040 | | mg/L | |
| | | | Dissolved Potassium (K) | 2014/10/27 | <0.30 | | mg/L | |
| | | | Dissolved Sodium (Na) | 2014/10/27 | <0.50 | | mg/L | |
| 7694558 | MAP | RPD | Dissolved Calcium (Ca) | 2014/10/27 | 0.028 | | % | 20 |
| | | | Dissolved Magnesium (Mg) | 2014/10/27 | 0.59 | | % | 20 |
| | | | Dissolved Potassium (K) | 2014/10/27 | 0.12 | | % | 20 |
| | | | Dissolved Sodium (Na) | 2014/10/27 | 0.43 | | % | 20 |
| 7696493 | JH0 | Matrix Spike | Total Mercury (Hg) | 2014/10/28 | | 111 | % | 80 - 120 |
| 7696493 | JH0 | Spiked Blank | Total Mercury (Hg) | 2014/10/28 | | 88 | % | 80 - 120 |
| 7696493 | JH0 | Method Blank | Total Mercury (Hg) | 2014/10/28 | <0.0020 | | ug/L | |
| 7696493 | JH0 | RPD | Total Mercury (Hg) | 2014/10/28 | NC | | % | 20 |
| 7698248 | MAP | Matrix Spike | Dissolved Calcium (Ca) | 2014/10/29 | | NC | % | 80 - 120 |
| | | | Dissolved Magnesium (Mg) | 2014/10/29 | | 91 | % | 80 - 120 |
| | | | Dissolved Potassium (K) | 2014/10/29 | | 96 | % | 80 - 120 |
| | | | Dissolved Sodium (Na) | 2014/10/29 | | 94 | % | 80 - 120 |
| 7698248 | MAP | Spiked Blank | Dissolved Calcium (Ca) | 2014/10/29 | | 102 | % | 80 - 120 |
| | | | Dissolved Magnesium (Mg) | 2014/10/29 | | 96 | % | 80 - 120 |
| | | | Dissolved Potassium (K) | 2014/10/29 | | 98 | % | 80 - 120 |
| | | | Dissolved Sodium (Na) | 2014/10/29 | | 95 | % | 80 - 120 |
| 7698248 | MAP | Method Blank | Dissolved Calcium (Ca) | 2014/10/29 | <0.30 | | mg/L | |
| | | | Dissolved Magnesium (Mg) | 2014/10/29 | <0.20 | | mg/L | |
| | | | Dissolved Potassium (K) | 2014/10/29 | <0.30 | | mg/L | |
| | | | Dissolved Sodium (Na) | 2014/10/29 | <0.50 | | mg/L | |
| 7698248 | MAP | RPD | Dissolved Calcium (Ca) | 2014/10/29 | 0.44 | | % | 20 |
| | | | Dissolved Magnesium (Mg) | 2014/10/29 | 0.24 | | % | 20 |
| | | | Dissolved Potassium (K) | 2014/10/29 | NC | | % | 20 |

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Sampler Initials: BHP

QUALITY ASSURANCE REPORT(CONT'D)

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | Recovery | Units | QC Limits |
|---|------|---------|-----------------------|------------------|-------|----------|-------|-----------|
| | | | Dissolved Sodium (Na) | 2014/10/29 | 1.7 | | % | 20 |
| <p>N/A = Not Applicable</p> <p>Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.</p> <p>Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.</p> <p>Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.</p> <p>Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.</p> <p>NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).</p> <p>NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).</p> <p>(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.</p> | | | | | | | | |



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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Peng Liang, Analyst II

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Crupi, Kayla

From: Proudfoot, Hayley
Sent: October 7, 2014 03:09 PM
To: Michael, Connie
Subject: Potable Water

Hi Connie,

Over the past few weeks I have been sending you various potable water data on facilities in the Prairie region. Some of the emails included recommendations for corrective action, including ensuring proper signage is posted, at Lyleton, Regway, Aden, and Wildhorse.

Can you please confirm that you have received these emails? Can you confirm that signage is posted where is has been recommended, and keep me in the loop on when the corrective action work takes place?

If you have any questions concerning water quality in Prairie region please do not hesitate to contact me at any time.

Thank you,
Hayley

Hayley Proudfoot
Environmental Analyst | Analyste de l'environnement
Environmental Programs Division | Division des programmes environnementaux
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**PUBLIC WORKS AND
GOVERNMENT SERVICES CANADA**

**Canada Border Services Agency
Site-Specific Potable Water Management Plan
Wild Horse Border Crossing Facility, Alberta**



March 2013

Project No.: 0125 056 02

Prepared for:

Public Works and Government Services Canada
5th Floor, Telus Plaza North, 10025 Jasper Avenue
Edmonton, Alberta
T5J 1S6

Prepared by:

EGE Engineering Ltd.
511 Pepperloaf Cres.
Winnipeg, Manitoba
R3R 1E6

EGE Engineering Ltd. Engineering, Geosciences & Environmental

March 14, 2013

File: 0125 056 02

Public Works and Government Services Canada
Environmental Services
5th Floor, Telus Plaza North, 10025 Jasper Avenue
Edmonton, Alberta
T5J 1S6

**Attention: Mr. Michael Brownlee
Environmental Specialist**

**RE: Site-Specific Potable Water Management Plan
Wild Horse Border Crossing Facility, Alberta**

Dear Mr. Brownlee,

EGE Engineering Ltd. is pleased to submit the following Site-Specific Potable Water Management Plan completed for the Wild Horse Border Crossing Facility located south of Wild Horse, Alberta. The site-specific Management Plan was completed to serve as a "user's manual" for the facility in meeting their obligations to ensure safe drinking water at the site.

Should you have any questions or require any additional information on the report please contact the undersigned at (204) 226-7378.

Sincerely,

EGE ENGINEERING LTD.



Larry Bielus, M.Sc., P.Eng.
Senior Geological Engineer
Lpb/lb

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- Tab 9 - Bottled Water Equipment Sanitization Method
- Tab 10 - Maintenance Logs

**Canada Border Service Agency
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 Wild Horse Border Crossing Facility, Alberta
 March 2013**

1.0 INTRODUCTION

EGE Engineering Ltd. (EGE), in association with Associated Engineering (AE), were retained by Public Works and Government Services Canada (PWGSC), Environmental Services Branch - Western Region on behalf of the Canada Border Services Agency (CBSA), to conduct a Site-Specific Potable Water Risk Assessment and to develop a Site-Specific Potable Water Management Plan for the Wild Horse Border Crossing Facility located south of Wild Horse, Alberta. The program was completed under the Environmental Services Supply Agreement, PWGSC File Number R.060382.002 and in accordance with EGE's proposal for environmental services, dated October 2, 2012 ⁽¹⁾. The Site-Specific Potable Water Risk Assessment has been submitted under separate cover.

The Site-Specific Potable Water Management Plan was developed using the guidelines, principles and information sources referenced in the Terms of Reference (ToR) ⁽²⁾, including: Health Canada's *Guidance for Providing Safe Drinking Water in Areas of Federal Jurisdiction* (December 2009) ⁽³⁾; *CBSA National Potable Water Quality Monitoring Program*; *CBSA Facility Management Database*; *CBSA Checklist*; Health Canada's *Guidelines for Canadian Drinking Water Quality* (August 2012) ⁽⁴⁾; and *Risk-Based Evaluation Tool for Potable Water Management at CBSA Border Crossing Facilities* (December 2011) ⁽⁵⁾. As outlined in the ToR, the specific project objectives for the Management Plan were to prepare a document that would serve as a comprehensive management tool for the facility managers and maintenance staff.

1.1 PURPOSE OF MANAGEMENT PLAN

As a federal employer, CBSA is required to ensure that the drinking water that it provides to staff and visitors at its border crossing facilities across the country is safe, reliable and available in sufficient quantity. Health Canada provides guidance that is intended to assist federal site managers in fulfilling their obligations in providing safe potable water, but in some cases, a concerted effort is needed to adequately evaluate the state of its systems that will ultimately result in corrective actions being taken (where necessary), and regular site-specific water quality monitoring being performed.

The Potable Water Management Plan serves as a "user's manual" for the facility managers, the water system operators and others responsible for providing safe drinking water quality. To be effective, the Management Plan is site-specific in nature, and is required to provide all procedures, signage examples, template log sheets and equipment documentation needed for adequate operation of the treatment and distribution network. The Management Plan also outlines a proposed potable water quality sampling program. The recommended management components are derived from the guidance provided by Health Canada ⁽³⁾. CBSA, through PWGSC, has contracted EGE to develop the Site-Specific Potable Water Management Plan for the Wild Horse Border Crossing Facility.

1.2 DEFINITIONS

Aesthetic Objective (AO) - Aesthetic objectives address parameters that may affect consumer acceptance of the water even though the substance is found at a concentration below which health effects appear. These parameters generally affect characteristics such as taste, odour and colour.

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Aquifer - A geological formation of permeable rock, sand or gravel that conducts groundwater and yields significant quantities of water to springs and wells.

Biofilm - A community of microorganisms attached to a solid surface, such as the inside wall of a pipe, in an aquatic environment.

Chlorine Residual - Where chlorine or chloramine is used as a secondary disinfectant, chlorine residual is the concentration of chlorine species present in the water after the oxidant demand has been satisfied. Also referred to as Free Chlorine Residual.

Drinking Water - Water that is safe for human consumption.

Drinking Water System - All aspects from the point of collection of water to the consumer (can include groundwater supplies, surface water, storage reservoirs and supply systems, intakes, treatment systems, service reservoirs, distribution systems and plumbing).

Escherichia coli (E.coli) - *E.coli* is a member of the total coliform group of bacteria and is the only member that is found exclusively in the faeces of humans and other animals. Its presence in water indicates not only recent faecal contamination of the water but also the possible presence of intestinal disease-causing bacteria, viruses and protozoa. The detection of *E.coli* should lead to the immediate issue of a boil water advisory and to corrective actions being taken.

Groundwater - Subsurface water occurring below the water table (phreatic surface) in the saturated zone, in which all pores are filled with water under hydrostatic pressure.

Groundwater Under the Direct Influence of Surface Water (GUDI) - Any water beneath the surface of the ground with: (i) occurrence of insects or other microorganisms, algae, organic debris or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium*; or (ii) significant fluctuations in water characteristics such as turbidity, temperature or pH that may closely correlate to climatological or surface water conditions.

Guidelines for Canadian Drinking Water Quality - The most recent version of the Health Canada guidelines containing health based, aesthetic or operation guidelines for varying parameters.

Heterotrophic plate count (HPC) - Heterotrophs are those microorganisms that use organic compounds for most or all of their carbon requirements. Most bacteria, including many of the bacteria associated with drinking water systems, are heterotrophs. HPC is a microbial method that uses colony formation on culture media to approximate the levels of heterotrophic flora. HPC does not, however, give an indication of the types of organisms present or their sources.

Maximum Acceptable Concentration (MAC) - MACs are the health-based limits for drinking water contaminants established in the Health Canada Guidelines for Canadian Drinking Water Quality. They are designed to protect human health. Guidelines are based on exposure over a lifetime.

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Microorganisms - There are three main types of microorganism that can be found in drinking water: bacteria; viruses; and protozoa. These can exist naturally or can occur as a result of contamination from human or animal waste.

Micro System - A drinking water system that serves between one and twenty-five people.

Monitoring Program - A list of substances that should be routinely monitored. A sanitary survey, in combination with a vulnerabilities assessment and baseline chemical analysis, will provide the information required to develop an appropriate monitoring program and treatment regime.

Non-Potable Water - Water that does not meet the definition of Drinking Water (ie: water that contains contaminants at concentrations in excess of the Guidelines for Canadian Drinking Water Quality).

Plumbing - A building's distribution pipes for bringing in the water supply. It includes pipes, fixtures and other apparatuses, soil, waste and vent pipes, along with connections within and adjacent to the building.

Point of Entry (POE) - The point at which the raw, untreated water enters a building and the water treatment system.

Potable Water - see Drinking Water.

Point of Use (POU) - Any fixture or location where water is distributed for human use, such as faucets, toilets, dishwashers, hoses, bottled water dispenser, etc.

Sanitary Survey - An on-site review, from intake to tap, of a water utility's raw water quality, facilities, equipment, operations and maintenance records for the purpose of evaluating the utility's ability to adequately treat source water in order to produce and deliver safe drinking water.

Secure Groundwater - Groundwater from an aquifer where microbiological contamination is unlikely to occur due to the formation of the rock, which protects the aquifer. It is typically determined by a hydrogeologist or other well specialist. Note: even the most secure groundwater may be at some risk of contamination, particularly from enteric viruses.

Surface Water - Surface water is: (i) any water body on the land surface, including running water such as streams, rivers and brooks or quiescent water such as lakes, reservoirs and ponds; (ii) water open to the atmosphere and subject to surface run-off.

Total Coliforms - Total coliforms belong to the family Enterobacteriaceae, that contain various species of the genera *Escherichia*, *Klebsiella*, *Enterobacter*, *Citrobacter*, *Serratia*, and many others. Some members of these groups are naturally occurring in the environment and are of faecal origin, while others are found exclusively in the environment. For this reason, total coliforms are not good indicators of faecal contamination.

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Vulnerabilities Assessment - A comprehensive assessment of the vulnerability of the source water in the environment. It includes three elements: (i) delineation of the watersheds, aquifers and their protection areas; (ii) identification of hazards, including contaminants of concern and their sources, where possible to determine; and (iii) assessment of susceptibility to contamination, and ranking of the hazards.

Watershed - The area draining naturally from a system of watercourses and leading to one body of water.

1.3 ROLES AND RESPONSIBILITIES

There is no single federal department that has authority over drinking water quality on federal lands. Health Canada provides guidance upon request and leadership, but has no mandate to ensure safe drinking water in the federal realm. Each department or responsible authority is in charge of implementing a drinking water program in areas within its mandate and should be accountable for carrying out its duties. However, given the differences in the departmental structures, defining precisely who is responsible for drinking water management is difficult.

Each person involved with a drinking water program needs to know what is expected of them and their level of responsibility. Departments should make sure that all required tasks have been assigned to specific and qualified staff. While the duties to be performed can be contracted to a third party, the accountability and responsibility for meeting the drinking water program objectives remains with each department.

In addition to meeting regulatory requirements, federal departments, drinking water system operators, and other responsible authorities are expected to be able to demonstrate due diligence in carrying out their duties (whether these duties are regulated or not). Demonstrating due diligence means taking every precaution reasonable in the given circumstances to avoid harm. It also means having mechanisms in place to deal with non-compliance issues and for holding employees accountable for their decisions and actions. Some typical roles and responsibilities are outlined below.

Responsible Authority (RA) - The RA employs one or more persons and includes the RA's organization and any person who acts on behalf of the RA. In the context of drinking water programs, the RA includes each department and all levels of management. Although the employer may hire or designate a manager or operator-in-charge of drinking water systems, a duty remains with the employer to ensure that all requirements of the drinking water program are met. This duty is met through a commitment to the implementation, validation and verification of program elements, as well as through the appropriate response to complaints or deficiencies.

Manager or Water Treatment Plant Operator - The manager or water treatment operator, is ideally an individual who is on-site at the facility on a daily basis. In situations where one person cares for more than one facility, this person is expected to visit each facility on a regular schedule. The manager or operator-in-charge, is responsible for ensuring that the water treatment plant/system is operated in accordance with the appropriate protocols and guidelines, as well as for ensuring that the water consumers have access to safe drinking water.

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This person must assess the facility to identify any risks to the drinking water quality. This person must also develop a protocol specific to their facilities that references any applicable regulations and which follows best management practices. Other management duties include:

- Assessing the facility to identify risks to occupational and environmental health, specific to the purveyance of drinking water;
- Developing a mitigation or remediation plan, including time frames, costs and risk statements, to correct deficiencies;
- Developing a training and information plan for the employees who operate and maintain facilities;
- Securing services from qualified, accredited laboratories and consultants, as required;
- Developing a records system for potable water management;
- Developing incident and emergency response plans, including a communications plan;
- Preparing an annual report on all aspects of the drinking water system, including incidents and remedial actions;
- Developing public information packages;
- Encouraging the use of best management practices for system operations; and
- Ensuring that a third party evaluation/audit procedure is in place (and that cooperation is provided to ensure that all information is available to the auditor).

The manager or operator-in-charge must also ensure that anyone affected by problems with the drinking water supply is notified and kept well informed of developments. Potential contacts include: occupants; management; health and safety representatives at the facility; and the local Medical Officer of Health. Provincial regulatory branches could also be consulted. If the quality of the water at the facility is deemed unsafe, the manager is responsible for providing an alternate and safe supply of potable water for drinking, dental hygiene and food preparation.

Technical Support Staff for Monitoring Drinking Water Quality Results - These staff members are responsible for ensuring that the quality of drinking water is being monitored and results interpreted and communicated with the Responsible Authorities. In some situations, technical support staff may sample and test the drinking water quality, and are then responsible for following the sampling procedures to ensure consistent and accurate test results. If a portable lab has been used, staff must ensure that the QA/QC procedures are followed. If a laboratory service is used, staff must verify that the laboratory service is accredited to perform testing of the specific parameters.

Health and Safety Representative - Health and safety representatives at the facility should be involved and informed throughout the testing procedure and involved with the communication process. They can reinforce communications made by the manager or operator-in-charge and may facilitate the lines of communication by acting as liaisons between employees and management.

At the Wild Horse Border Crossing Facility, it is not clear that a defined matrix of responsibilities has been established for the operation of the water treatment system. Currently, on-site staff do not conduct regular monitoring or maintenance of the system. A third-party plumbing contractor is available to make maintenance calls, but is only notified when problems arise. PWGSC, on behalf of CBSA, currently

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manages the operation of the water treatment plant, but staff are not on-site daily and rely upon the local CBSA staff to notify them of problems between scheduled visits. Local CBSA staff do not have training in the operation and maintenance of the water treatment system. CBSA are the RA.

1.4 REQUIRED TRAINING AND AVAILABLE TRAINING RESOURCES

All staff or personnel involved in drinking water quality management must be adequately trained for their role and function(s). This includes personnel whose duties relate only to distribution systems, including plumbing. Training should be planned, executed and documented on a continuous basis, and must be directly applicable to and appropriate to the person's specific job and the type of facility being operated or managed. Specific mechanisms should be developed for evaluating the appropriateness and effectiveness of the training.

Regardless of whether an operator is certified, training is essential. Operators of federal drinking water treatment facilities must be trained to the appropriate level for their facility. It is recommended that federal departments follow the Association of Boards of Certification (ABC) system for classification of facilities and certification of operators, which are used by most other Canadian jurisdictions. In the case of less complex treatment systems, operators may participate in system-specific training that would provide a site-specific equivalent to a certification for this role only. Such a certificate would not be recognized as being valid at other facilities. For departments with an "equivalent to certified" program, mandatory certification may not be required, but operators should aim to have an equivalent amount of training as their certified counterparts.

At the Wild Horse Border Crossing Facility, staff that are not familiar with the treatment equipment will need to become familiar with the Operations and Maintenance (O&M) manual found in Appendix A. The staff will also need to refer to the Material Safety Data Sheets (MSDS) for the softener salt and Res Care chemical for proper handling procedures, which is found in Tab 4 of the O & M Manual in Appendix A.

It is recommended that the staff who are designated to operate the water system at the Wild Horse Facility obtain their Class 1 Water Treatment certification from the Alberta Operator's Association. Since the source water is at risk and has experienced contamination, the operator(s) should become aware of the risks associated with these types of systems. If the system were to be upgraded to a potable system, with more treatment processes (primary and secondary disinfection) the system will become more complex and need a higher level of understanding of the operation and maintenance.

2.0 SITE DESCRIPTION

The Wild Horse Border Crossing Facility is located on Provincial Highway 41, approximately 120 km south of Medicine Hat, Alberta and 20 km west of the Saskatchewan border. The 142 by 142 m property is occupied by a CPE (Customs Port of Entry) office building and small storage shed at the southeast corner, a residence and detached garage at the southwest corner (West Residence) and a second residence and detached garage/emergency generator building (East Residence) located in the south central area of the property. A RCMP communication tower is also located in the southeast corner of the site. The buildings occupy approximately 1.75% of the site, with the remainder of the site comprised of landscaped and naturally vegetated areas, and parking/driveway areas along the south boundary of the site. Figures 01 and 02 provide a location plan and surrounding land use plan for the site, respectively. A site plan is provided as Figure 03 and a building floor plan for the CPE is provided as Figure 04.

The facility is currently staffed by four full-time CBSA customs inspectors. Public use of the facility is restricted to the administration area at the south end of the CPE building and public washroom accessed from the northeast exterior of the CPE building. On-site personnel indicated the Wild Horse Border Crossing Facility can receive up to 233 vehicles on a peak day. The average number of daily visitors was not provided by CBSA, however, it is expected that this number is substantially less than the 233 peak vehicles. The number of visitors using the washroom facilities is also expected to be even less. On the basis that the number of on-site staff and site visitors using the washroom facilities is less than twenty-five, the water system at Wild Horse would be classified as a “micro-system” ⁽³⁾.

Independent septic systems are installed at each of the two residences and the CPE building. The systems consist of: two dual-chamber fibreglass tanks (residences) and one dual-chamber concrete septic tank (CPE building); and septic ejector jets that discharge to the surface north of each building. There is also a fourth ejector jet northeast of the current CPE building ejector jet that is no longer being used. A previous wastewater study completed at the Wild Horse Border Crossing Facility in 2002, by Wardrop Engineering Inc ⁽⁶⁾, indicated that the CPE building and east residence used the septic ejectors, while the west residence utilized a septic field located north of the building.

The septic tank and the ejector jet for the CPE building are located approximately 17 m west-southwest and 45 m north of the existing water well, respectively. The three septic ejector jets discharge directly to ground surface approximately 56 m north of the CPE building, 48 m north of the east residence and 37 m north of the west residence. The construction details and exact location of the septic field north of the west residence are not known; however, based on a previous site plan provided by CBSA, the field is shown to be approximately 20 m north of the building. The same site plan also illustrates two former in-ground septic fields located approximately 15 and 25 m north of the CPE building, which likely served both the east residence and the CPE building. The approximate locations of the in-ground septic fields and ejector jets are illustrated on Figure 03.

The surrounding land use consists of Range Road 23A and natural grass/pasture land to the west, natural grassland to the north, east and southwest, crop land to the southeast (U.S.), and the Port of Wild Horse U.S. Customs crossing located across Highway 41 south of the site. The nearest surface water

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body is a small creek located approximately 400 m northeast of the site. The surrounding land use is shown on Figure 02.

CBSA is currently the water system authority for the facility. PWGSC personnel provide on-site management of the buildings and structures on the property. The RCMP communication tower and equipment located in the basement of the CPE building are maintained independently of CBSA and PWGSC activities. On-site servicing of the water treatment system is provided by Stenger's Plumbing and Heating Ltd., a third party contractor based out of Medicine Hat, Alberta.

2.1 WATER SOURCE TYPE, DESCRIPTION AND LOCATION

Historically, raw water for the Wild Horse Border Crossing Facility has been supplied by groundwater wells. Geological information presented on the water well drilling record, dated September 1989, indicates that the stratigraphy underlying the site includes up to 21 m of glacial-lacustrine sediments, consisting of undifferentiated sand and clay till deposits. The underlying bedrock is composed of sandstone, siltstone, mudstone and shale of the Oldman/Foremost Formations. The regional groundwater supply below Onefour, Alberta, which is located about 22 km northwest of Wild Horse, Alberta, is from the sandstone bedrock ⁽⁷⁾.

The topography at the site and in the surrounding area is flat to slightly undulating. Overall, the topography at the site slopes slightly to the north, with the north-western area sloping to the northwest and the north-eastern area to the northeast. Surface runoff appears to drain towards the east and west sides of the site, and the direction of the shallow groundwater flow is expected to follow the site topography. Regionally, groundwater flow is expected to be towards Milk River Lake, which is located about 1.2 km northwest of the site. The shallow and regional groundwater flow directions are shown on Figure 03.

According to the Government of Alberta Water Well Database, there are seventeen water wells located within a 2.5 km radius of the site. Ten of the wells were listed for domestic and/or livestock use, three were listed for livestock use only, and four were listed as use unknown. Four wells were listed in the database for the Canada Customs property, one dated 1928 (to a depth of 15.24 m), one dated prior to 1971 (to a depth of 106.68 m), one dated 1976 (to a depth of 18.29 m) and the most recent well dated 1989 (originally drilled to a depth of 30.48 m and later deepened to 91.44 m).

Three abandoned wells and one existing well were identified on the property at the time of the 2012 site inspection, and it is assumed that these correspond to the four wells listed in the database. However, with the exception of the 1976 and 1989 wells, there are no records indicating the exact location of the 1928 and pre-1971 wells. There are also no decommissioning reports available for any of the abandoned wells on the property. The locations of the three abandoned wells and the one existing well that were identified at the site are highlighted on Figure 03.

2.2 WATER SOURCE DESCRIPTION

Currently, raw water at the site is supplied by the 1989 well (Well ID 153054), a 91.44 m deep well located approximately 17 m northeast of the CPE building. The well was originally installed in May, 1989

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by Camfield Drilling Services Ltd., based out of Lethbridge, Alberta. The well was installed using air rotary methods and was deepened to 91.44 m in November 1989. The lithology of the well was described as 3 m of fine grained sand and silt, overlying clay till, containing some sandy sections, extending to a depth of 21.3 m. The overburden was underlain by multiple layers of shale, siltstone and sandstone, to the completion depth of 91.44 m, within the Verdigris Member (Foremost Formation). The deeper overburden (15.8 to 18.9 m) and the intermediate depth sandstone (58 to 59 m) were noted to have poor production and/or water quality.

The well is cased with a 16.81 cm outside diameter steel casing, which extends to a depth of 24.38 m and has a finished stick-up of 0.71 m. A 14.12 cm diameter steel liner was installed inside the steel casing to a depth of 60.96 m, with a secondary 0.10 m diameter steel liner installed to a final depth of 91.44 m below ground surface. The secondary liner is perforated between a depth of 85.34 and 91.44 m, with an open bottom. The annular seal, consisting of cement/grout, was placed from surface to a depth of 60.96 m. The formation log indicates that the well intake was installed within layers of siltstone and sandstone. A two hour test pumping program was completed after installation at a sustained pumping rate of 90.92 L/min, and from a withdrawal depth of 42.7 m and a starting static water level of 30.5 m. The water level after 120 minutes of pumping was 42.7 m. The well is located at UTM coordinates: 557358 E, 5427722 N, in Zone 12U. The water level in the well was measured on October 26, 2012 at 13.655 m below the top of the casing. The wellhead was secured with an aluminum cap attached with two screws and two bolts.

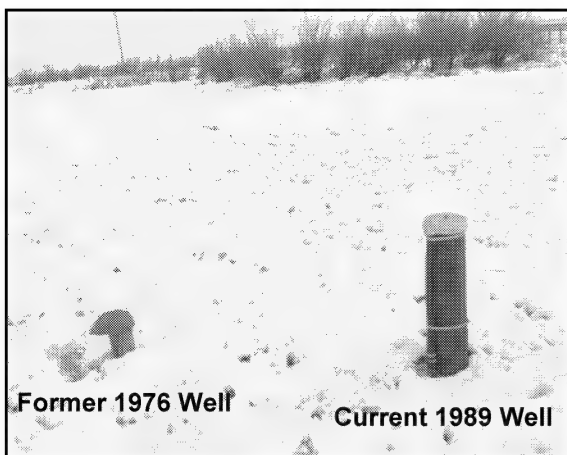


Photo 01: Former (left) and current (right) wells located northeast of the CPE building.



Photo 02: Submersible pump wiring at current well.

The raw water pipeline between the current well and the CPE building is a 25 mm HDPE pipe, and consists of new and old sections of pipe. The pipe enters the northeast corner of the CPE building, where it is reduced down to a 19 mm copper pipe after passing through a flow restrictor. The raw water is then passed through a POE treatment system.

Potable water for the Wild Horse Border Crossing Facility is provided through the supply of 20 L bottled water containers obtained from Pure & Simple Water in Lethbridge, Alberta. The CPE building and residences each have individual water cooler dispensers for use by CBSA staff.

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2.3 TREATMENT SYSTEM DESCRIPTION

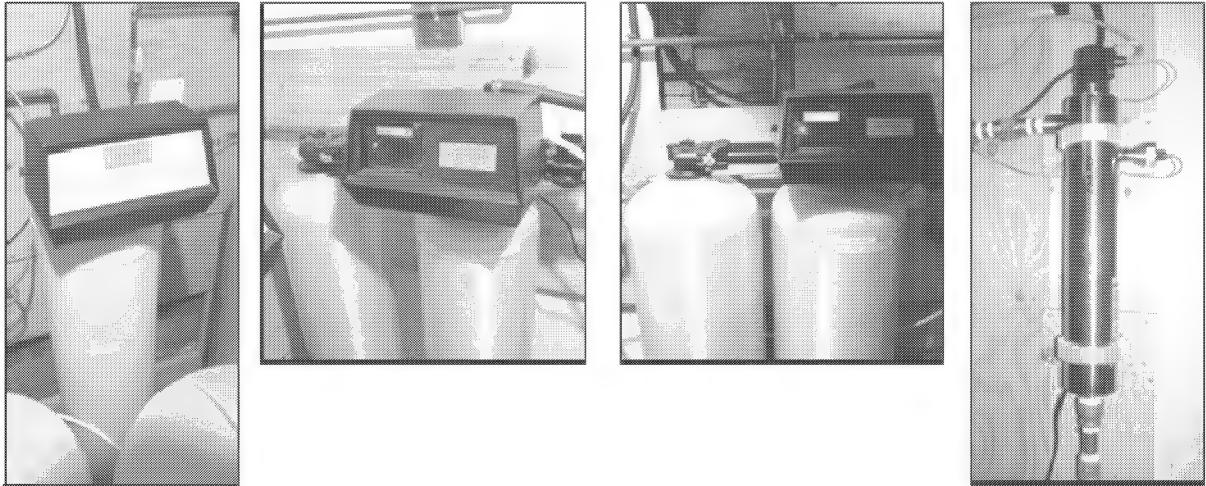
The micro-scale POE water treatment system is located in the northeast corner of the basement in the CPE building, as shown on Figure 04. The raw water enters the CPE building through the basement wall in the northeast corner near the floor. The raw water supply is connected to a hydro-pneumatic tank then flows through a multimedia filter to reduce turbidity. Following the multimedia filter, the water then passes through an iron guard softener for hardness and iron reduction, and then through a second set of resin beds for tannin removal (to improve water clarity for the ultraviolet (UV) unit). The last process in the system is a UV reactor for pathogen inactivation. The two ion exchange systems (the Iron Guard Softener and the Tannin Removal System) are both dual vessel arrangements that operate in a duty-standby mode; when one vessel is regenerating, the other can still treat water.

This system supplies all water to the CPE building and the two residences. The 30 liter-per-minute water treatment system is designed to reduce turbidity, hardness, iron and manganese. The UV reactor is intended to provide a pathogen barrier, but in actuality it is not technically rated for this application for public water systems. A stand-alone reverse osmosis (RO) system is also in place next to the water treatment system. This provides RO water to the humidifier on the furnace and had been used to provide a source of purified water for the bottled water dispensers. However, as noted earlier, CBSA has switched to a third-party supplier for bottled water and no longer uses the RO system to fill the 20 L bottles.

A detailed plan of the water treatment area and a process flow diagram are provided on Figures 05 and 06, respectively. The following is a summary of the treatment equipment on site. Representative photographs of the treatment system are also provided below.

| Equipment Description | Year Installed | Quantity | Manufacturer | Model Number | Dimensions (mm) |
|-------------------------|----------------|----------|--------------|--------------|-----------------|
| Well Pump | 2005 | 1 | Goulds | 7LS05412 | n/a |
| Hydro-pneumatic Tank | 2005 | 1 | Jet-Rite 2 | PJR 6 | 8.0 litres |
| Pressure/Pump - Control | 2005 | 1 | Controlpres | CP115 | n/a |
| Multi Media Filter | 2005 | 1 | Novatek | NMMF10 | 250 x 1200 |
| MMF Control Valve | 2005 | 1 | Fleck | 2150 | n/a |
| Iron Guard Softener | 2011 | 2 | Novo | CDA-30 | 230 x 1220 |
| Softener Control Valve | 2011 | 1 | Fleck | 9100 XT | n/a |
| Iron Guard Brine Tank | 2011 | 1 | USFilter | n/a | 550 x 900 |
| Tannin Removal | 2012 | 2 | Novo | COD-20 | 300 x 1300 |
| Softener Control Valve | 2012 | 1 | Fleck | 9100 XT | n/a |
| Brine Tank | 2011 | 1 | USFilter | n/a | 550 x 900 |
| UV Reactor | 2012 | 1 | Sterilight | SCM-320 | n/a |
| Reverse Osmosis | 2004 | 1 | US Filter | WGR 300 | n/a |

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Photos 03 to 06: From left to right: Multimedia Filter, Softeners, Tannin Removal Filters and UV reactor.



Photo 07: Reverse Osmosis system.

The distribution system consists of site piping between the CPE building and the two residences, as well as the plumbing distribution systems within each of the three buildings. The site piping between the CPE building and the east residence is 25 mm HDPE tubing. The water supply then passes through the east residence and leaves through a second 25 mm HDPE line that feeds the west residence. At the POE to each of the three buildings the 25 mm HDPE pipe is reduced down to a 19 mm copper pipe that feeds the buildings' plumbing supply. Each building supply has a shut off valve at the POE. As well, each lavatory and toilet have their own shut off valves. All three buildings have copper supply lines throughout. The POE and POU locations at the CPE building, and the east and west residences, are shown on Figures 04, 07 and 08, respectively.

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The following table provides a list of the fixtures present at the CPE building.

| Equipment Description | Location | Water Service Size | Comments |
|-----------------------|--------------------------------|--------------------|--|
| Toilet - 6L per flush | Staff Washroom | 12 mm COLD | |
| Hand Sink | Staff Washroom | 12 mm HOT/COLD | |
| Toilet - 6L per flush | Public Washroom | 12 mm COLD | |
| Hand Sink | Public Washroom | 12 mm HOT/COLD | |
| Toilet | 2 nd Floor Bathroom | 12 mm HOT/COLD | No access* |
| Hand Sink | 2 nd Floor Bathroom | 12 mm HOT/COLD | No access* |
| Shower Head | 2 nd Floor Bathroom | 12 mm mixed | No access* |
| Dish Sink | 2 nd Floor Kitchen | 12 mm HOT/COLD | |
| Wall Hydrant | Outside NE corner | 12 mm COLD | Non-freeze style with vacuum breaker. Untreated supply |

* Room was locked and no CBSA or PWGSC personnel had keys or means of access.

The following is a list the fixtures present at the west residence:

| Equipment Description | Location | Water Service Size | Comments |
|-----------------------|--------------------|--------------------|---------------------------------------|
| Toilet - 6L per flush | Bathroom | 12 mm COLD | |
| Hand Sink | Bathroom | 12 mm HOT/COLD | |
| Bath tub Faucet | Bathroom | 12 mm HOT/COLD | |
| Shower Head | Bathroom | 12 mm mixed | |
| Dish Sink | Kitchen | 12 mm HOT/COLD | |
| Hot Water Tank | Basement | 19 mm COLD | 40 US gallon - gas heater |
| Washing Machine | Basement | 12 mm HOT/COLD | |
| Wall Hydrant | Outside: N side | 12 mm COLD | Non-freeze style with vacuum breaker. |
| Wall Hydrant | Outside: SE corner | 12 mm COLD | Non-freeze style with vacuum breaker. |

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The following is a list the fixtures present at the east residence:

| Equipment Description | Location | Water Service Size | Comments |
|-----------------------|--------------------|--------------------|---------------------------------------|
| Toilet - 6L per flush | Bathroom | 12 mm COLD | |
| Hand Sink | Bathroom | 12 mm HOT/COLD | |
| Bath tub Faucet | Bathroom | 12 mm HOT/COLD | |
| Shower Head | Bathroom | 12 mm mixed | |
| Dish Sink | Kitchen | 12 mm HOT/COLD | |
| Hot Water Tank | Basement | 12 mm COLD | 40 US gallon - gas heater |
| Wall Hydrant | Outside: NE corner | 12 mm COLD | Non-freeze style with vacuum breaker. |

Potable water for the Wild Horse Border Crossing Facility is provided through 20 L bottled water dispensers. The 20 L bottles were previously filled on site from the reverse osmosis treatment system in the basement of the CPE building. However, CBSA has recently switched to a third-party off-site supplier for bottled water, Pure & Simple Water located in Lethbridge, Alberta. The CPE building and residences each have individual water cooler dispensers for use by CBSA staff. Extra full and empty bottles are stored in the CPE building next to the bottled water dispenser. There were no readily accessible instructions for sanitization of the units on site and there no written records when the last cleaning took place. Representative photos of the CPE building and west residence dispensers are provided below.



Photos 08 and 09: Bottled water dispensers at the CPE building (left) and west residence (right).

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The following table provides a list of the bottled water dispenser units present at the Wild Horse Border Crossing Facility.

| Equipment Location | Year Installed | Quantity | Manufacturer | Model Number |
|--------------------|----------------|----------|--------------|--------------|
| CPE Building | 2004 | 1 | EBCO/OASIS | B1SRPK-0101 |
| West Residence | 2004 | 1 | Greenway | GWD200W |
| East Residence | 2004 | 1 | Greenway | GWD200W |

2.4 DESCRIPTION OF VULNERABILITY RISK AND THREATS

The potable water supply is bottled water delivered in 20 L containers. Other than ensuring regular maintenance of the three dispensing units to ensure proper operation, and performing monthly disinfection to eliminate potential bacteriological growth, there is minimal risk with the current bottled water system.

The current CPE building water treatment system is not adequate to deal with any pathogens in the water source, therefore, it is deemed non-potable, along with all plumbing fixtures in the building. At the time of the site visit, all fixtures were adequately labelled, with “Non-Potable, Do Not Drink” signage and should continue to be displayed as such. However, the supply of non-potable water to a public facility is a source of risk and vulnerability to staff and visitors, as many people by habit do not think twice about consuming water from a tap (e.g. brushing teeth, washing hands, showering). The regular staff may be well aware that the water is non-potable, but visitors and the public may not be fully aware of the situation, and there is risk that they could consume the water from the taps.

The CPE building has one public washroom as part of the facility, however, there is no access to potable water (ie: bottled water dispenser) in this washroom or an adjacent public space. A bottled water dispenser should be located in an area clearly accessible to the public. It should be noted that the exterior wall hydrant on the CPE building is connected to the raw water supply ahead of the building treatment system. If the treatment system is upgraded to potable use, this tap will still remain non-potable.

It is not uncommon to find total coliforms in untreated groundwater in rural agricultural areas. Total coliforms are naturally occurring in the soil and in the gut of humans and animals, while *E.coli* are present only in the gut of humans and animals ⁽³⁾. Based on the location and construction of the current and former wells, the most likely source and pathway for well and/or aquifer contamination is surface water run-off occurring directly into improperly constructed, sealed, capped or abandoned wells. This conclusion is supported by the historical information, which indicated that previous wellheads operated in close proximity to septic tanks, septic ejectors and former septic fields. In addition, an undocumented well may exist at the site, and it is not known if a proper seal was made or if the well was leaking while it operated or if proper decommissioning was completed.

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There is also potential for impacts from a former landfill that was located northeast of the CPE building. On a regional basis, off-site agricultural land use may also be contributing to the overall contamination of the regional aquifer and the issues related to coliforms may be the result of factors outside the property boundary.

The presence of the septic tanks and ejectors on-site presents a potential vulnerability to the groundwater supply. The historic operation of a septic system at the site, likely since the property was developed in 1928, has provided a long-term source of potential contaminants to the aquifer. The septic ejectors are located north of the buildings, and the ejector north of the CPE building does not meet the provincial setback distance of 50 m from the wellhead and none of the ejectors meet the setback distance of 90 m from the property line. The west ejector does not meet the setback distance of 45 m from a building. Other potential risks to the aquifer from on-site activities include the former use of heating fuel, which has historically been stored in both underground and aboveground storage tanks (USTs and ASTs).

The following is a list of the risks and vulnerabilities noted from the site visit and interviews:

| Item | Risks and Vulnerabilities | Level of Risk |
|-------------------------|--|---|
| Source Water Protection | <ul style="list-style-type: none"> The presence of septic tanks on-site and operation of septic ejectors north of the buildings increases the vulnerability of the local and regional aquifer to contamination. The practice of surface discharge of wastewater on the property should be discontinued as this practice poses a risk to the well head and source water contamination. The ejectors do not meet the setback distance of 90 m from the property line or 50 m from a well. The surrounding agricultural and livestock land use increases the vulnerability of the regional aquifer. The presence of former on-site ASTs and USTs containing heating oil increases the vulnerability of the local aquifer to contamination. The presence of a former landfill (dump site) north of the CPE building increases the vulnerability of the local aquifer to contamination. The presence of three abandoned wells, and possibly the presence of an additional abandoned well at an unknown location, increases the vulnerability of the local aquifer to contamination. | <ul style="list-style-type: none"> Low Medium Low Low Medium Medium |
| Wellhead Protection | <ul style="list-style-type: none"> Poor drainage away from the wellhead increases the vulnerability of the aquifer to contamination from surface infiltration along the well casing or directly into the well head. | <ul style="list-style-type: none"> Medium |

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| Item | Risks and Vulnerabilities | Level of Risk |
|---|---|--|
| CPE Building Water Treatment System and Distribution System | <ul style="list-style-type: none"> The current water treatment system is not adequate to achieve sufficient pathogen and virus inactivation. With a history of positive results for microbiological contamination of the raw water source, the system should be upgraded, with primary disinfection through chlorine, and UV disinfection retained for multi-barrier treatment. The system is vulnerable to the transmission of pathogens and viruses to the users, even when not consuming the water. | <ul style="list-style-type: none"> Medium |
| No Chlorine Residual in Distribution System | <ul style="list-style-type: none"> Lack of chlorine residual in the distribution system increases the risk that bacterial amplification may occur and that pathogens can be transmitted by the water distribution system. Although a chlorine residual is not technically required for a micro-system, it may still occur when chlorine is used as a disinfectant. | <ul style="list-style-type: none"> Low |
| Bottled Water Supply for Public Use | <ul style="list-style-type: none"> The only bottled water supply is located in the staff area. Without an obvious source of potable water for the public, there is a risk that visitors to the facility may drink water in the public washroom. | <ul style="list-style-type: none"> Low |
| Hand Washing in Public Washroom | <ul style="list-style-type: none"> There is a risk that pathogens and viruses can be transferred after washing hands in non-potable water. The lack of a hand sanitizer and instructions for use in the washroom increases the risk of this transfer. | <ul style="list-style-type: none"> Low |
| Regular Maintenance of Bottled Water Dispensers | <ul style="list-style-type: none"> Bottled water systems have the potential to develop bacterial growth without proper and regular maintenance to sanitize the system. | <ul style="list-style-type: none"> Low |
| Providing Non-Potable Water to Living Quarters (East and West Residences) | <ul style="list-style-type: none"> The CBSA employees reside both on-site and off-site, and therefore, a habit change is required when living on-site to adjust to the non-potable water source and to avoid consumption of the water. There is an increased risk for ingestion based on habits developed from living with potable water. Individuals who live with non-potable water develop stronger habits to avoid unnecessary consumption of the water, and they can also develop some tolerance to the specific water quality. The CBSA employees may accidentally ingest non-potable water during normal activities such as brushing teeth, washing hands, washing food and showering (see below). | <ul style="list-style-type: none"> Low Low |

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| Item | Risks and Vulnerabilities | Level of Risk |
|-------------------------|---|--|
| Presence of Showers | <ul style="list-style-type: none"> The showers in all three buildings are supplied with non-potable water, which increases the risk of ingestion of non-potable water and/or inhalation of non-potable water vapor, thereby transferring pathogens and viruses to the user. | <ul style="list-style-type: none"> Low |
| UV System Not Certified | <ul style="list-style-type: none"> The UV unit for a small public water system such as the CBSA Wild Horse Facility is required to be Certified NSF Standard 55 Class A. The existing UV unit (Sterilight Cobalt SCM-320) is not certified to the required standard for a public water system. The manufacturer recommends primary disinfection (chlorination) prior to secondary disinfection (UV) for this reactor model. | <ul style="list-style-type: none"> Medium Medium |

3.0 MAINTENANCE AND INSPECTIONS

3.1 MAINTENANCE AND INSPECTION REQUIREMENTS

The following table outlines the maintenance and inspection requirements for the major assets associated with the micro-scale water supply system at the Wild Horse Border Crossing Facility. Detailed information on system operation and maintenance is presented in the Operating and Maintenance Manual that is presented in Appendix A. A site specific maintenance and inspection log can be found within the Standard Operating Procedures that are provided within the Operating and Maintenance Manual in Appendix A. Specific procedures for well shock chlorination are provided in Section 3.2, and procedures for care and maintenance of the bottled water systems are provided in Section 3.3.

| Equipment Description | Maintenance Frequency | Maintenance Task |
|-----------------------|-----------------------|--|
| Raw Water Well | Annually | <ul style="list-style-type: none"> Check that the well is operated within the specified pumping rate. Monitor quantity of water produced to verify pump is working properly and the well yield is not dropping. |
| | Monthly | <ul style="list-style-type: none"> Read and record the static and operating water levels to determine data trends over time. Check that the well cap is securely in place and watertight. Check the pump and pipe connections, and that the well casing is adequately sealed. |
| Raw Water Supply Line | Monthly | <ul style="list-style-type: none"> Install a flow meter, and record the instantaneous and cumulative flow data. |
| Hydro Pneumatic Tank | Annually | <ul style="list-style-type: none"> Inspect tank for rust, leaks and sediment build-up. Drain and flush tank. Check pre-charge air pressure. |
| Pressure Switch | Annually | <ul style="list-style-type: none"> Check the start and stop pressure settings on the pressure gauge. |
| Multi Media Filter | Annually | <ul style="list-style-type: none"> Check the volume of media in the vessel to monitor for attrition. Top up or replace as per the supplier's recommendation. |

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| Equipment Description | Maintenance Frequency | Maintenance Task |
|--|-----------------------|--|
| MMF Control Valve | Monthly | <ul style="list-style-type: none"> • Check the "Time of Day" to ensure it is accurate and is moving. • Check for leaks. • Ensure that the backwash frequency is appropriate for the water quality. If the frequency is too low, the filters may plug more frequently and cause higher pressure on the incoming raw water line. • Watch and time a backwash cycle (or manually initiate one) to ensure it is as per the set points. |
| Iron Guard Softeners and Tannin Removal Filters | Annually | <ul style="list-style-type: none"> • Check the volume of resin in the vessels to monitor for attrition and exhaustion rate. Top up or replace as per the supplier's recommendation. |
| Softener Control Valve and Tannin Removal Filter Valve | Annually | <ul style="list-style-type: none"> • Check the "Time of Day" to ensure it is accurate and is moving. • Check for leaks. • Ensure that the backwash frequency is appropriate for the water quality. If the frequency is too low, the resin may exhaust and re-release iron/manganese as well as hardness into the treated water. • Ensure that the brine feed line is flowing and not plugged. • Watch and time a backwash cycle (or manually initiate one) to ensure it is as per the set points. |
| Brine Tanks | Weekly | <ul style="list-style-type: none"> • Inspect salt level and Res Care reservoir level (Note: there is no Res Care for the Tannin Removal Filters). • Inspect brine feed tubing to softeners. • Ensure wick is saturated (may need to be re-saturated if salt levels were allowed to get too low). |
| Pentek Filter ahead of UV System | Monthly | <ul style="list-style-type: none"> • Replace the filter cartridge monthly or sooner if the differential pressure gauge on the unit is in the "Red Zone". |

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| Equipment Description | Maintenance Frequency | Maintenance Task |
|-----------------------|-----------------------|---|
| UV Reactor | Bi-Monthly | <ul style="list-style-type: none"> Check the output percentage, and if the reading is below 75%, then the Tannin Removal Filter regeneration frequency may require adjustment or the resin mesh may require replacement. If staining becomes evident in the building fixtures due to failure in the water softeners (eg. hardness and iron stains), check the UV quartz sleeve for fouling. The sleeve may need to be cleaned with a CLR type product (calcium-lime-rust remover) to improve the output percentage. |
| | Annually | <ul style="list-style-type: none"> Replace the UV lamp annually. The unit has a countdown timer from 365 days to 0. Ensure that a spare quartz sleeve and lamp is available for change out. |
| Reverse Osmosis Unit | Weekly | <ul style="list-style-type: none"> Flush the membrane weekly during regular use. Replace the membrane when the differential pressure continues to exceed the manufacturer's recommendation after a flush. |
| | Monthly | <ul style="list-style-type: none"> The RO unit has three cartridge filters that should be replaced monthly if the system is regularly used or sooner if the differential pressure gauges exceed 7 psi. |
| Distribution System | Bi-Weekly | <ul style="list-style-type: none"> Clean and check toilet tank for iron stains. Excessive staining and calcium deposits may indicate trouble with the water softener. |
| | Annually | <ul style="list-style-type: none"> Shock chlorinate the well and water distribution system (or more frequently, if total coliforms or <i>E.coli</i> are found at the POE or POU sampling points). Flush the plumbing system (or more frequently, if HPC counts show re-growth in the system). |

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3.2 WHY AND HOW TO SHOCK CHLORINATE THE WELL

A recommended guide to why and how to shock chlorinate a groundwater well is provided on Health Canada's website at: <http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/well-puits-eng.php> under the heading "What's In Your Well? - A Guide to Well Water Treatment and Maintenance". The following information is reproduced from this website.

Typically, groundwater is naturally clean and safe for consumption. Because the overlying soil acts as a filter, groundwater is usually free of disease-causing microorganisms. However, contamination may occur following improper installation of well casings or caps, after a break in the casing or as a result of contaminated surface water entering the well. Contamination can also occur if wells are drilled in fractured bedrock without an adequate layer of protective soil and with less than the recommended minimum casing length.

To prevent illness, wells should be properly maintained and the water quality tested on a regular basis for the presence of microbial contaminants. The well water should also be tested on occasion for possible inorganic and organic chemical contaminants, in particular if contamination is suspected. The well water should also be tested immediately following any change in its clarity, colour, odour or taste or if there has been a significant change in the surrounding land use.

Through regular assessment and testing, the microbial and chemical safety of the well water can be verified, and corrective action implemented in a timely manner, if required.

Well Maintenance

Proper siting, location, construction and maintenance of a well will help to minimize the likelihood of contamination. The well cap should be checked regularly to ensure that it is securely in place and watertight. Joints, cracks and connections in the well casing should be sealed. Pumps and pipes should also be checked on a regular basis, and any changes in water quality should be investigated.

Surface drainage should be directed away from the well casing and surface water should not collect near the well. The well itself should also not be located downhill from any source of pollution.

Corrective Action for Water that Does Not Meet the Recommended Guidelines

If test results show an unacceptable level of total coliforms or *E. coli*, it is necessary to shock treat the well and, if possible, find and eliminate the source of contamination. If the source of contamination cannot be found and eliminated, the well water should be tested on a regular basis and the well should receive continuous disinfection.

Disinfection can be done using unscented household bleach. The table below outlines the quantity of bleach required to properly disinfect new and existing small diameter drilled wells and larger diameter dug wells.

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**Disinfection of Well Water with Unscented Household Bleach
 (Approximately 5.2% Hypochlorite)**

| Depth of Water in Well | Volume of Bleach Added | | | |
|------------------------|---------------------------------|-----------------|-----------------------------|-----------------|
| | Casing Diameter 15 cm (drilled) | | Casing Diameter 90 cm (dug) | |
| | New Well * | Existing Well * | New Well * | Existing Well * |
| 1.0 m | 100 mL | 20 mL | 3.2 L | 0.6 L |
| 3.0 m | 300 mL | 60 mL | 9.8 L | 2.0 L |
| 5.0 m | 500 mL | 100 mL | 16.5 L | 3.0 L |
| 10.0 m | 1000 mL | 200 mL | 32.0 L | 6.5 L |

** New wells require a chlorine concentration of 250 parts per million (ppm) for effective disinfection, whereas existing wells require 50 ppm chlorine.*

Steps for Chlorine Disinfection

- Add the amount of unscented bleach determined in the table above to the bottom of the well and then agitate the water. Connect a garden hose to a nearby tap and wash down the inside wall of the well. This will ensure thorough mixing of the chlorine and the water throughout the well.
- Start the pump and bleed air from the pressure tank. Open each tap and allow the water to run through all taps until a smell of chlorine is detected, then turn off the taps. If a strong smell is not detected, add more bleach to the well.
- Allow the water to sit in the system for 12 to 24 hours.
- Start the pump and run water through the outside hose away from grass and shrubbery until the strong smell of chlorine disappears. Make certain that the water does not enter any watercourse. Finally, open the indoor taps until the system is completely flushed.
- Wait 48 hours, then sample the water using the instructions and bottle provided by the laboratory. In the meantime, find another source of water or boil the water for one minute before drinking it. Two consecutive "safe" tests, performed on samples obtained over a period of one to three weeks, will probably indicate that the treatment has been effective.
- If the shock treatment solves the problem, repeat bacteriological testing in three to four months.

If the above steps do not alleviate the problem, it is recommended that the source of the ongoing contamination be determined and corrected, possibly with professional help. If remediation is not possible, a permanent alternative solution, such as a new well or installation of a drinking water disinfection device, should be considered.

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3.3 BOTTLED WATER DISPENSER CLEANING

Potable water for the Wild Horse Border Crossing Facility is provided through 20 L bottled water dispensers. The 20 L bottles were previously filled on-site from the reverse osmosis treatment system in the basement of the CPE building, however, CBSA recently switched to a third-party supplier, Pure & Simple Water, in Lethbridge, Alberta. The CPE building and two residences each have individual water cooler dispensers for use by CBSA staff. There were no readily accessible instructions for sanitization of the units on site and there were no written records when the last cleaning took place.

The following information is taken from Health Canada's website at: http://www.hc-sc.gc.ca/fn-an/securit/facts-faits/faqs_bottle_water-eau_embouteillee_e.html under the heading "Questions and Answers on Bottled Water" (sub-heading "How should a water cooler be cleaned?").

Reservoir

- Clean the bottled water cooler at every bottle change.
- Unplug the cord from electrical outlet of cooler and remove the empty bottle (carboy).
- Drain the water from the stainless steel reservoir(s) through faucet(s).
- Prepare a disinfecting solution by adding 15 ml of household bleach to 4.5 L of water, however, other solutions may also be suitable and one should consult the owners manual (note: some companies suggest using a solution of one part vinegar and three parts water to clean the reservoir of scale before cleaning with bleach).
- Wash reservoir thoroughly with bleach solution and let stand for not less than two minutes (to be effective) and not more than five minutes (to prevent corrosion).
- Drain bleach/disinfection solution from reservoir through faucet(s).
- Rinse reservoir thoroughly with clean tap water, draining water through faucets, to remove any traces of the bleach/disinfection solution.

Drip Tray (located under faucets):

- Lift off the drip tray, remove the screen and wash both the tray and the screen in mild detergent.
- Rinse both well in clean tap water and replace on cooler.

Replacing the Water Bottle

- Wash hands with soap and warm water before handling. Alternatively, if clean protective gloves are used (ie: latex), discard or disinfect after each use and prior to reuse. Protective gloves should never replace proper hand washing and hygiene.
- Wipe the top and neck of the new bottle with a paper towel dipped in household bleach solution (15 ml of bleach and 4.5 L of water. Rubbing alcohol may also be used, but must be completely evaporated before placing the bottle in the cooler.
- Remove the cap from the new bottle and place the new bottle on the cooler.

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3.4 OPERATING AND MAINTENANCE MANUAL

The Operating and Maintenance (O & M) Manual is included in Appendix A. The O & M Manual has been set up with the following tabbed sections:

- Tab 1 - Standard Operating Procedures, Drawings - Plans
- Tab 2 - Raw Water Pumping Systems
- Tab 3 - Multimedia Filter Equipment
- Tab 4 - Iron Guard Softener Equipment
- Tab 5 - Tannin Removal Softener Equipment
- Tab 6 - Reverse Osmosis Equipment
- Tab 7 - Ultraviolet Light Disinfection Equipment
- Tab 8 - Miscellaneous Equipment
- Tab 9 - Bottled Water Equipment Sanitization Method
- Tab 10 - Maintenance Logs

3.5 MAINTENANCE AND INSPECTION RECORDS

It is important to maintain a record of all maintenance activities performed on the water supply, treatment and distribution system at the Wild Horse Border Crossing Facility. These records should be maintained in one location that is known and accessible, so that the information is easy to find and access. At Wild Horse, the maintenance and inspection records should be kept at the location of the water treatment equipment.

Previous maintenance and inspection records completed by the contract plumber (Stenger's Plumbing and Heating Ltd.) are included in Tab 10 of the O & M Manual provided in Appendix A. A template maintenance log for the iron guard water softener is included in Tab 1 of the O & M Manual. Additional templates for non-potable water signage, UV maintenance, RO maintenance, tannin removal maintenance and groundwater well monitoring are included in Tab 1.

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4.0 SAMPLING

4.1 EXISTING WATER SYSTEM

Since the potable water supplied to the site is bottled, the bottled water from each of the three dispensers should be monitored twice yearly for microbiological parameters (total coliforms and *E.coli*) to assist in evaluating the effectiveness of the recommended sanitization protocol described in Section 3.3. As a check on the supplied bottled water source, the twice yearly sampling procedure should also include total metals and general chemistry, including turbidity. HPC should also be considered as an optional test to monitor bacteriological growth at the bottled water dispenser.

The water treatment system at the Wild Horse Border Crossing Facility is considered a micro-system. However, all water systems operated by the Government of Canada, which service up to 5,000 people, regardless of size, require sampling for total coliforms and *E.coli* four times per month. This frequency can be reduced to quarterly sampling for micro-systems, with non-disinfected groundwater supplies, and to semi-annual for disinfected groundwater supplies, if one of two conditions are met: the completion of a vulnerabilities assessment, with acceptable results; or a history of acceptable bacteriological quality.

The recent vulnerabilities assessment has identified several potential risks to the groundwater supply and treatment system, and the raw water source was considered non-potable after the results of the November 2011 sampling indicated the presence of total coliforms in both the raw and treated water. However, the groundwater well was subsequently shock chlorinated in November/December 2011, and the tests completed after chlorination did not indicate the presence of coliforms in the water. On this basis, CBSA considers the recent tests for water quality, to represent an acceptable history, therefore, one of the two conditions has been met and the monitoring frequency of quarterly microbiological sampling for micro-systems, with non-disinfected groundwater supplies, is appropriate for the site.

The quarterly sampling should include: the microbiological parameters (total coliforms and *E.coli*); total metals; and general chemistry, including turbidity. The POU locations and the raw water source should be included in the quarterly sampling, to evaluate whether biological amplification is occurring within the treatment and distribution system, and to assist in developing short term mitigation measures. The POU locations that require sampling include: the CPE staff washroom sink; the CPE public washroom sink; the CPE bottled water dispenser; the CPE 2nd floor washroom sink; the CPE 2nd floor kitchen sink; the east residence washroom sink; the east residence kitchen sink; the east residence bottled water dispenser; the west residence washroom sink; the west residence kitchen sink; and the west residence bottled water dispenser. The quarterly sampling should be scheduled to include the periods when the risk of contamination to the groundwater is the highest (spring and fall). HPC should also be considered as an optional test to monitor bacteriological growth within the distribution system.

4.2 FUTURE WATER SYSTEM

If the corrective actions recommended in this report are undertaken, particularly with respect to primary chlorine disinfection, a revised sampling regime is recommended. The HC guidance document ⁽³⁾ requires that raw or renovated drinking water systems and/or systems where a monitoring history has not yet been

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established, must establish a history of acceptable bacteriological quality by sampling for total coliforms and *E.coli* four times per month for one year.

For very small systems, CBSA may choose to accept either a vulnerabilities assessment with acceptable results, or a history of acceptable bacteriological quality, to implement a reduced monitoring frequency. In addition, for GUDI systems, CBSA may choose to reduce the monitoring frequency for turbidity and chlorine residual, if they are satisfied that they have in place adequate strategies to ensure health protection. The monitoring program for the Wild Horse micro-system, once the conditions for reduced monitoring as outlined above are met, is:

- Total coliforms and *E.coli* - quarterly at the POE and POU locations, if daily turbidity of treated water is consistently less than 1.0 NTU;
- Turbidity - daily (leaving the treatment system); and
- Chlorine residual (if applicable) - daily (leaving the treatment system).

Because the water treatment system does not currently provide chlorine disinfection, there is no requirement to monitor chlorine residual in the distribution system. However, if the water treatment system is upgraded, with the addition of chlorine disinfection, the chlorine residual should be monitored continuously or daily, which is the requirement for GUDI. If the raw water source becomes a secure groundwater supply, then the chlorine residual monitoring can be reduced to once per month. The same monitoring requirements would also apply for turbidity. It is noted that for the GUDI category, federal departments may choose to reduce the monitoring frequency for turbidity and chlorine residuals, if they are satisfied that they have in place adequate strategies to ensure health protection.

If the option of only retaining UV disinfection is considered to supply water to the sinks, toilets and showers (without the primary chlorine disinfection), a stringent and frequent monitoring program would be required, in addition to maintaining the bottled water system as the primary potable water supply. The monitoring frequency for a UV disinfection system without chlorine would include at a minimum, weekly sampling of the POE and POU locations for total coliforms and *E.coli* during periods of runoff (spring) and bi-monthly sampling during the remainder of the year. This also assumes upgrading the UV system to be Certified NSF Standard 55 Class A.

4.3 SAMPLING POINTS

There is a hose tap connection on the copper raw water line before it enters the pressure tank in the basement of the CPE building. This point is a suitable location for sampling the raw water (POE) as it enters the building before any treatment occurs. Access to the groundwater in the well is not possible given the pump installation, associated wiring and piping. A second potential raw water sampling location is available at the wall hydrant on the CPE building, which receives untreated water.

There are eleven POU sampling locations at the Wild Horse Border Crossing Facility. These include the following:

- CPE building (5) - main floor staff washroom sink, main floor public washroom sink, main floor bottled water dispenser, second floor washroom sink and second floor kitchen sink;

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- East residence (3) - main floor washroom sink, main floor kitchen sink and main floor bottled water dispenser; and
- West residence (3) - main floor washroom sink, main floor kitchen sink and main floor bottled water dispenser.

There are also bath tub faucets and shower head fixtures that could be sampled if required. The POU sampling locations are highlighted on Figures 04, 07 and 08.

4.4 SAMPLING PROCEDURES

4.4.1 Preparation

A bottle order should be placed with the laboratory at least one week in advance of the anticipated sampling date. The bottle order should consist of a description of the number of samples, analyses required and any quality assurance/quality control (QA/QC) samples. The information contained in the bottle order should also specify that the water being tested is potable water and the analyses must meet the Health Canada Guidelines for Canadian Drinking Water Quality (HC-GCDWQ). It is recommended that QA/QC procedures include a minimum of one blind duplicate sample per each sampling event.

Based on the recommended quarterly sampling program for the Wild Horse Border Crossing Facility, the bottle order for each sampling event should consist of the following request:

- Ten samples (POE plus eight POU plus one QA/QC) for microbiological analysis (total coliforms and *E.coli*);
- Ten samples for total metals analysis; and
- Ten samples for routine water, including turbidity.

For the two quarterly periods that correspond to the semi-annual sampling for the bottled water dispensers, the bottle order should consist of the following:

- Thirteen samples (POE plus eleven POU plus one QA/QC) for microbiological analysis (total coliforms and *E.coli*);
- Thirteen samples for total metals analysis; and
- Thirteen samples for routine water, including turbidity.

4.4.2 Sampling Naming Convention

Descriptive sample identification codes should be used to provide easy identification of the location of the sample and analysis requested. Samples should be identified as shown in the following example:

| Location ID | Building ID | POE or POU | Fixture Type | Floor/Sample Number |
|-------------|-------------|------------|--------------|---------------------|
| WILD – | CPE – | POE – | PIPE – | 1.1 |
| | ER – | POU – | TAP – | 1.2 |
| | WR – | | BOT – | 1.3 |

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The abbreviation codes used above are described as follows: WILD identifies the border crossing location of Wild Horse; the building codes identify the buildings the samples were collected from, in this case, the Customs Port of Entry building (CPE), East Residence (ER) and West Residence (WR); POE or POU identifies whether the sample was the Point of Entry or Point of Use; PIPE identifies the sample point as the POE water service copper pipe, TAP identifies the fixture type as faucet (kitchen or bathroom sink), BOT identifies a bottled water dispenser; and 1.1 and 1.2 indicates the floor (first floor or main floor) and sample number (consecutively numbered).

As an example, a sample collected at the main floor washroom sink in the CPE building would be coded: WILD-CPE-POU-TAP-1.1 (if it was the first sample collected). A sample collected at the bottled water dispenser would be coded: WILD-CPE-POU-BOT-1.2 (if it was the second sample collected). The blind duplicate QA/QC sample should be labelled: WILD-DUP.

4.4.3 Sample Collection and Documentation

Each sample point should be disinfected prior to sampling using disinfectant wipes. Where present, the aerators or dispersion screens should be removed from the faucets, and then the faucet or tap cleaned with the disinfectant wipe. Once the sampling point has been disinfected, water should be flushed through the point for a period of two minutes. Following this initial flushing, the laboratory supplied sample bottle should be filled for analysis of the microbiological parameters (total coliforms and *E.coli*). Care should be taken to maintain aseptic sampling conditions and the cap for the microbiological sample bottle should only be removed immediately before the sample is collected, and then replaced immediately after sample collection. Handling of the microbiological sample container should be kept to a minimum.

After the microbiological sample is collected, water should be flushed through the sample point for a further period of three minutes, for a total of five minutes of flushing. Following this second flushing, samples should be collected into laboratory supplied sample containers for total metals and general chemistry. The total metal samples will require preservation in the field using laboratory supplied preservatives, which are to be added to the sample bottles at the midpoint when filling the container. The chain of custody form must be marked that the samples were field preserved but not field filtered.

All sample bottles should be filled to the levels specified by the laboratory or as marked on the bottles, and then immediately capped and labeled, noting all of the pertinent information using a permanent waterproof ink marker. All sample bottles should be properly identified, with the site specific sample identification codes described in Section 4.2.2 above. The sample containers should then be carefully packed into a cooler equipped with ice packs to ensure the samples remain cold. The date and time the samples were collected should be noted in a field data book, along with any relevant observations made during the sampling process.

The collected samples should be stored on ice packs in a cooler until drop-off at the receiving laboratory. The detailed chain of custody record, as supplied by the laboratory, should be completed prior to leaving the project site, placed with the samples and accompany the shipment to the receiving laboratory. Samples must be delivered directly to the receiving laboratory the same day they were collected to ensure that the holding times are not exceeded prior to analysis. This is critical for the microbiological samples, which are required to be processed at the receiving laboratory within 24 hours of collection.

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4.4.4 Chain of Custody Preparation

The chain of custody record, as supplied by the laboratory, should be completed immediately after collecting the samples, and prior to leaving the project site. The chain of custody form provides information on the sample location, sample identification, sample date, sample matrix and the requested analyses. In addition, the chain of custody form records the name and contact information for the sampler, and requires a signature that the samples have been released to the analytical laboratory. The completed chain of custody record should be placed into a sealed watertight bag and placed with the samples inside the cooler and accompany the shipment to the receiving laboratory. All pertinent information should be included on the form.

4.4.5 Sample Shipment

Samples collected for microbiological analyses (total coliforms and *E.coli*) must be analyzed by the laboratory within 24 hours of sample collection. It is imperative that the samples be delivered to the laboratory the same day they are collected. This will generally mean that the samples be hand delivered from the site to the laboratory to ensure compliance with this requirement. For this reason, samples should not be collected on a Friday, since the laboratory will not be able to process and analyze the samples until Monday, unless special arrangements are made in advance.

4.4.6 Receipt of Analytical Results

Upon receipt of the analytical results, the reported concentrations of water quality parameters should be compared with the most current version of the HC-GCDWQ.

4.5 LABORATORY QUALIFICATION

When testing and analyzing water samples, federal departments should use a laboratory accredited by one of the following: Canadian Association for Laboratory Accreditation Inc. (CALA); the Standards Council of Canada (SCC); or in Quebec, the Bureau de normalization du Québec (BNQ). Accreditation is awarded to a laboratory for each individual test.

In the case of compliance monitoring for some microbiological parameters (ie: total coliforms and *E.coli*), managers and/or operators of facilities may allow trained personnel to use potable water test kits rather than an accredited laboratory. However, in order to ensure quality control, a minimum of 10% of all samples should be sent to an accredited laboratory for analysis. When using test kits, the operator must ensure the instruments are regularly calibrated and that reagents are not past their due date.

4.6 PARAMETERS AND FREQUENCY

The recommended sampling program for the Wild Horse Border Crossing Facility, including the parameters and frequency, is provided in the table below. As noted earlier, this program may change should the water treatment system be upgraded to include chlorine disinfection, in which case the current Management Plan should be updated to reflect the changes in the water treatment system.

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| Locations | Parameters | Frequency |
|---|---|--|
| POE - CPE basement sample tap POU - CPE staff washroom sink POU - CPE public washroom sink POU - CPE 2 nd floor washroom sink POU - CPE 2 nd floor kitchen sink POU - ER washroom sink POU - ER kitchen sink POU - WR washroom sink POU - WR kitchen sink | Microbiological (total coliforms and <i>E.coli</i>) Total Metals (Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cr+6, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, U, V, Zn) Routine Water - General Chemistry (total and pp alkalinity, HCO ₃ , CO ₃ , EC, OH, ion balance, ion sum, dissolved (Ca, Fe, K, Mg, Mn, Na), Cl, SO ₄ , NO ₃ , NO ₂ , NO ₃ -N+NO ₂ -N, pH, hardness, TDS and turbidity) | Four times per year (January, April, July and October) |
| POU - CPE bottled water POU - ER bottled water POU - WR bottled water | Microbiological (total coliforms and <i>E.coli</i>) Total Metals (Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cr+6, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Si, Sn, Sr, Ti, Tl, U, V, Zn) Routine Water - General Chemistry (total and pp alkalinity, HCO ₃ , CO ₃ , EC, OH, ion balance, ion sum, dissolved (Ca, Fe, K, Mg, Mn, Na), Cl, SO ₄ , NO ₃ , NO ₂ , NO ₃ -N+NO ₂ -N, pH, hardness, TDS and turbidity) | Two times per year (April and October) |

4.7 SAMPLING RECORDS AND INTEGRATION WITH CBSA DATABASE

Maintaining a system of documentation is essential to quality management. Monitoring all operational and compliance aspects of a drinking water system establishes on-going verification that the water is safe to drink and that the operations plan is being followed. Documentation is also important as a tool for verifying that training activities are taking place and that corrective actions have been taken as required. It also helps track the continuous improvement of operations or policies. Comprehensive documentation is also a fundamental requirement in the event that any operator or manager be required to make a case for due diligence.

All records, including "as-built" construction records, should be maintained. Records related to policy and procedures should be kept a minimum of five years. All other routine records should be maintained for two years. This should include:

- Results of all bacterial and chemical analyses;
- All recorded chlorine residual and turbidity levels;

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- A summary of the analytical results obtained during the year, in tabular format and hard copy;
- Reports of any in-house operational procedures testing;
- Relevant correspondence;
- Communications protocols;
- Maintenance reports;
- Assessment reports;
- Operation and maintenance manuals, as-built drawings and "life-history cards";
- Manufacturer's information for each piece of equipment;
- Reports of any incidents, including remedial and emergency measures, boil advisories, shock chlorination, etc.;
- Auditor's reports;
- Record of corrective actions taken as part of operational controls or in the event of non-compliant finished water; and
- Training records, including test results, relevance of training and validation of the source of training.

CBSA has developed a Facility Management Database that incorporates many of the project elements discussed in this Management Plan into an overall, risk-based, vulnerability ranking system. The Database is used to assist CBSA in prioritizing locations that require corrective action. Through the series of Site-Specific Potable Water Risk Assessments being completed, information is being collected at various border crossing facilities to allow for a complete portrait of all components of the potable water management situation at each facility. The results of any assessment of the Wild Horse Border Crossing Facility, including regular monitoring and sampling, should be used as inputs to the database and risk-based evaluation tool for potable water management.

5.0 PROCEDURES FOR NON-POTABLE ANALYTICAL RESULTS

5.1 NOTIFICATION AND CHANNELS OF COMMUNICATION

Federal departments responsible for providing drinking water should prepare and maintain written emergency and incident response plans to deal with events that occur outside of normal operating conditions. Such plans should also identify potential events. Events that should be considered include: extreme or unusual weather events; natural disasters; unplanned human activities; line breaks; valve replacements; or extended power outages.

To address the cases of a suspected/confirmed event of microbiological contamination, the plan should include the possibility that a boil water advisory may need to be issued. For extreme events where a significant chemical/radiological contamination has or is expected to occur, drinking water avoidance advisories may be issued.

Drinking water advisories are public announcements to advise the public of an identified or expected risk to the water supply. Boil water advisories are related to possible or confirmed microbiological contamination of drinking water (including possible failures in the treatment or distribution system). Drinking water avoidance advisories are related to the chemical or radiological quality of the water, when the contaminant of concern may not be removed or inactivated by boiling.

A boil water advisory should be issued when the presence of total coliforms or *E.coli* is either detected or confirmed in the POU sample results. However, as long as an alternative source of potable water is available, such as the bottled water supply at Wild Horse, a boil water advisory is not likely required for bacterial exceedances in the non-potable supply. The guidance for issuing and rescinding boil water advisories is found at: http://hc-sc.gc.ca/ewh-semt/pubs/water-eau/boil_water-eau_ebullition/index-eng.php. Guidance for issuing and rescinding drinking water avoidance advisories is found at: <http://hc-sc.gc.ca/ewh-semt/pubs/water-eau/avoid-annul/index-eng.php>.

Incident response protocols should be established, with the understanding that notification and reporting are compatible with the existing provincial approach. These reporting relationships should be established well in advance, and are fundamental to public health protection and due diligence. This type of integrated information sharing is typically the trigger for implementing appropriate response and keeps all agencies properly informed whether the incident originates at a federal facility or municipal supply.

5.2 RE-SAMPLING AND GENERAL PROCEDURES

The general procedure to be followed when a non-potable water result is obtained from a potable water source should be based on the immediate protection of the water users, followed by an investigation of the issues that caused the non-potable water, and the completion of the necessary work to mitigate or eliminate the cause of the non-potable result.

The first action should be to ensure that there is no risk to water users from the non-potable result. If the non-potable result is obtained from the untreated source water, but not found at the POU, the non-potable

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result does not indicate an immediate threat to the user, since the water treatment system is working effectively to eliminate the contamination. This type of result does warrant that increased attention should be placed on the proper operation and maintenance of the treatment system to ensure that the non-potable water is adequately treated, with the knowledge that treatment failure could expose users to non-potable water. Further investigation should occur into the cause of the contamination of the source water and an attempt made to mitigate the problem(s). After mitigating the issues, the source water should be re-tested to determine if the mitigation measures were effective at solving the problem. The results of a non-potable source water result may also highlight changes to the water treatment process to ensure the effective removal of the contaminant.

If the non-potable result is obtained from a POU sampling location, the potable water system should be declared non-potable, staff and visitors should be informed not to consume the water, the appropriate warning signage should be installed at all points of use, and an alternative safe supply provided. A template for the required non-potable warning sign is provided in Appendix A, Tab 1. Generally, a bottled water supply is the most easily implemented alternative supply. Following these immediate steps, an investigation of the treatment system should be undertaken to determine why the system is not performing as intended in the removal of contaminants, and any necessary repairs or modifications should be made. After repairs or modifications, the treated water should be re-tested before being declared potable again. CBSA considers that the water is potable if two consecutive re-tests, following corrective actions, show compliance with the Health Canada Guidelines for Canadian Drinking Water Quality.

5.3 LIST OF CONTACTS

Contact information for the CBSA and PWGSC staff responsible for the Wild Horse Border Crossing Facility water treatment system is provided below. Also included is the contact information for the plumbing contractor responsible for the Wild Horse Border Crossing Facility through contract with PWGSC.

| Agency | Name and Address | Contact Information |
|--------|---|---|
| CBSA | Ms. Irena Forrester Environmental Coordinator Canada Border Service Agency 2588-27 th Street NE Calgary, AB T1Y 7G1 | Ph: 403-292-6688 Cell: 403-333-1963 Fax: 403-292-6699 E-mail: Irena.Forrester@cbsa-asfc.gc.ca |
| | Ms. Barbara Gray Senior Environmental Analyst Canada Border Service Agency 427 Laurier Avenue West, 10 th Floor Ottawa, ON K1A 0L8 | Ph: 613-960-9513 Cell: 613-866-7144 Fax: E-mail: Barbara.Gray@cbsa-asfc.gc.ca |

**Canada Border Service Agency
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| Agency | Name and Address | Contact Information |
|---------------------|---|---|
| PWGSC | Mr. Bob Coates Property and Facility Manager Public Works and Government Services Canada 1650, 635-8 th Avenue SW Calgary, AB T2P 3M3 | Ph: 403-359-5050 Cell: Fax: 403-381-0235 E-mail: Bob.Coates@pwgsc-tpsgc.gc.ca |
| | Mr. Charlie Vegter Building Operation and Maintenance Officer Public Works and Government Services Canada 1650, 635-8 th Avenue SW Calgary, AB T2P 3M3 | Ph: 403-653-1038 Cell: Fax: 403-653-4317 E-mail: Charlie.Vegter@pwgsc-tpsgc.gc.ca |
| | Mr. Réjean Bergeron National and NCR Potable Water Coordinator Public Works and Government Services Canada 2720 Riverside Drive Ottawa, ON K1A 0S5 | Ph: 613-736-3173 Cell: 613-316-1842 Fax: 613-736-2171 E-mail: Rejean.Bergeron@tpsgc-pwgsc.gc.ca |
| Plumbing Contractor | Mr. Lyle Stenger Manager Stenger's Plumbing and Heating Ltd. 19 Rossland Drive SE Medicine Hat, AB T1B 2B5 | Ph: 403-526-2251 Cell: Fax: 403-529-9316 E-mail: contact@stengersplumbing.ca |

5.4 SIGNAGE

Appropriate signage is currently in place at all locations where non-potable water is available for use by the local staff and general public. A copy of the template for the non-potable sign is included in Appendix A, Tab 1.

5.5 ALTERNATE WATER SUPPLY

There are no local alternate water supply systems available at the Wild Horse Border Crossing Facility. Bottled water is currently being used to supply the potable needs at the facility. This bottled water system should be maintained until a secure groundwater system, including a water treatment system capable of primary and secondary disinfection, can be installed. Currently, the Wild Horse Border Crossing Facility receives bottled water deliveries from a third-party supplier based in Lethbridge, Alberta. Alternative bottled water suppliers are located in Milk River or Medicine Hat, Alberta as well as nearby CBSA facilities at Aden and Coutts, Alberta.

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5.6 MECHANISM TO REINSTATE POTABLE WATER DISTRIBUTION

The goal of CBSA is to provide a source of water that provides safe drinking water for consumption at the Wild Horse Border Crossing Facility. This goal is met by a multi-barrier approach that enhances and protects water quality through well protection methods, distribution line upgrades, treatment, monitoring and inspections. The groundwater well at the Wild Horse site was shock chlorinated in November/December 2011, and the tests completed after the chlorination event did not indicate the presence of coliforms in the water. CBSA considers two consecutive tests that meet the HC-GCDWQ, after corrective action has been taken, to indicate that potable water had been restored.

However, with a history of positive tests showing microbiological contamination of the raw water source, it is recommended that water treatment upgrades at the Wild Horse site include, primary disinfection with chlorine. The existing UV disinfection should also be retained, as a redundant disinfection for multi-barrier treatment, and to reduce the chlorine dosage and contact time requirements. However, the existing UV system would need to be upgraded to NSF Standard 55 Class A for multi-barrier treatment.

Primary disinfection would consist of a sodium hypochlorite (chlorine) feed system to provide the necessary virus and pathogen inactivation in the raw water supply. UV is not recommended as a standalone disinfectant without chlorine, as it is not as effective at virus inactivation as chlorine. As a GUDI, the system should achieve a 3-log giardia inactivation rate (99.9%). To achieve this, the system will need to create storage after disinfection to allow sufficient chlorine contact time. The simplest method would be to place a series of hydro pneumatic tanks at the end of the treatment system. The volume of storage will be dictated by the consumption rate on-site. With washroom showers in each building, the required storage could be upwards of 400 L per building. At this high demand rate, the contact time required for 3-log giardia inactivation would likely require a relatively significant volume of storage, either in tanks or looped piping. Therefore, it will likely be economical and space saving to retain UV disinfection, with the chlorine, to help reduce the required chlorine dose and contact time.

Another strategy to reduce the chlorine dose and storage requirements would be to add cartridge filtration to the process, filtering down to 1.0 micron absolute to achieve higher log credits in the treatment process.

For multi-barrier treatment, an ultraviolet lamp (UV) set to dose at least 40 mJ/cm² should compliment the system, and as mentioned above, would likely reduce the chlorine dosage. The UV system should be in conformance to "NSF Standard 55 Class A", which includes UV intensity monitoring and a system shut-off, if the intensity drops below the stipulated limit for minimum disinfection. The intent of the UV system is to provide pathogen inactivation for the system.

With only the current non-NSF Standard 55 Class A UV disinfection in place, the water treatment system does not adequately provide for pathogen and virus inactivation, and it is recommended that the distribution system be shock chlorinated once per year to prevent bacteriological colonies from forming in the plumbing system or more frequently, if total coliforms or *E.coli* are found at the POE or POU sampling points. The procedures for shock chlorination of the well and water distribution system are provided in Section 3.2.

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As an option, UV disinfection could be used without chlorine disinfection, to supply water to the sinks, toilet and shower, but this system is not recommended for regular potable water use. If UV disinfection was retained without chlorine, there would also need to be a stringent and frequent monitoring program for bacteriological parameters and the bottled water system would need to be maintained as the primary potable water supply. This assumes the existing UV system would be upgraded to NSF Standard 55 Class A.

5.7 RECORD KEEPING AND REPORTING

A standard record keeping log form is provided in the Operating and Maintenance Manual provided in Appendix A. Section 4.5 also discussed the record keeping requirements for all information related to the water supply system.

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6.0 CLOSURE

This report has been prepared by EGE for the exclusive use of PWGSC and CBSA (the Client) for the specific application described in Section 1.0. The information and data contained herein are to be treated as confidential and are intended for the sole use of the client, and may not be relied upon by any other persons or entity without the express written consent of EGE and the Client.

Any use of this report by a third party, or any reliance on decisions made based on it, are the responsibility of such third parties. EGE does not accept any responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

The work has been conducted in accordance with generally accepted environmental engineering practices. Although every effort has been made to confirm that the information and data presented, including without limitation the results of any sampling and analyses conducted by EGE, is factual, complete and accurate, EGE makes no guarantees or warranties whatsoever, whether expressed or implied, with respect to such information or data.

The findings presented in this report are based on the conditions which existed on site at the time of the work, in the area of the work and in respect of the environmental media which were assessed. The Client, and any other parties using this report with the express written consent of the Client and EGE, should acknowledge that conditions affecting the site can vary with time, may vary in other areas of the site and that other media other than those described herein could be present on site. EGE cannot warrant against undiscovered environmental liabilities.

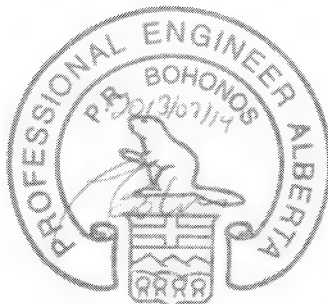
Should additional environmental information become available in the area of concern or in other areas of the site, EGE requests that this information be brought to our attention so that we may re-evaluate the findings and conclusions of this report.

Respectively Submitted,

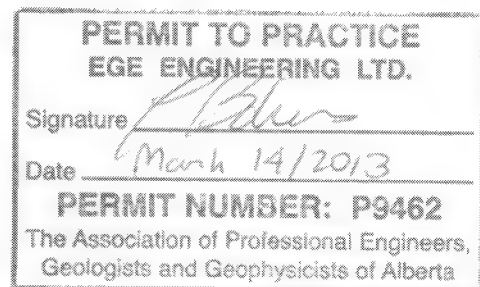
EGE ENGINEERING LTD.



David Klassen, P.Geo.
 Environmental Geoscientist




Peter Bohonos, P.Eng.
 Project Engineer



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7.0 REFERENCES

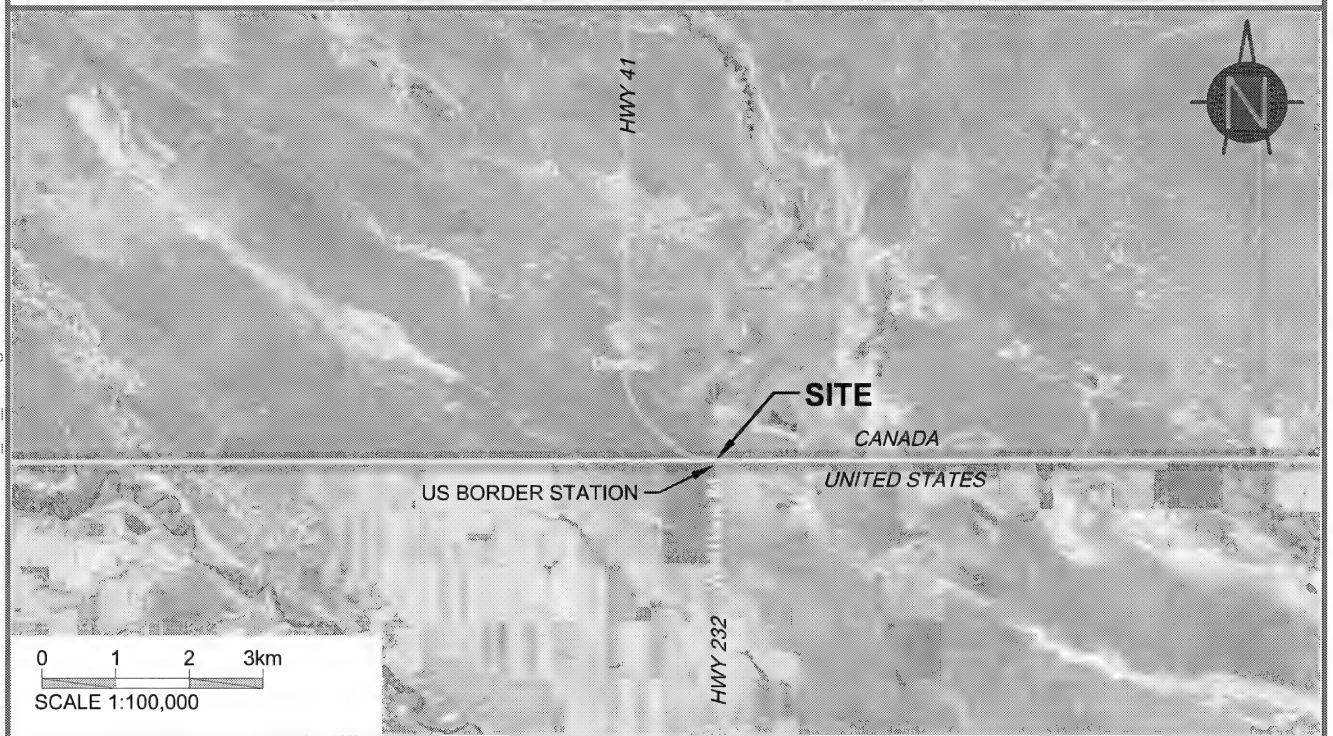
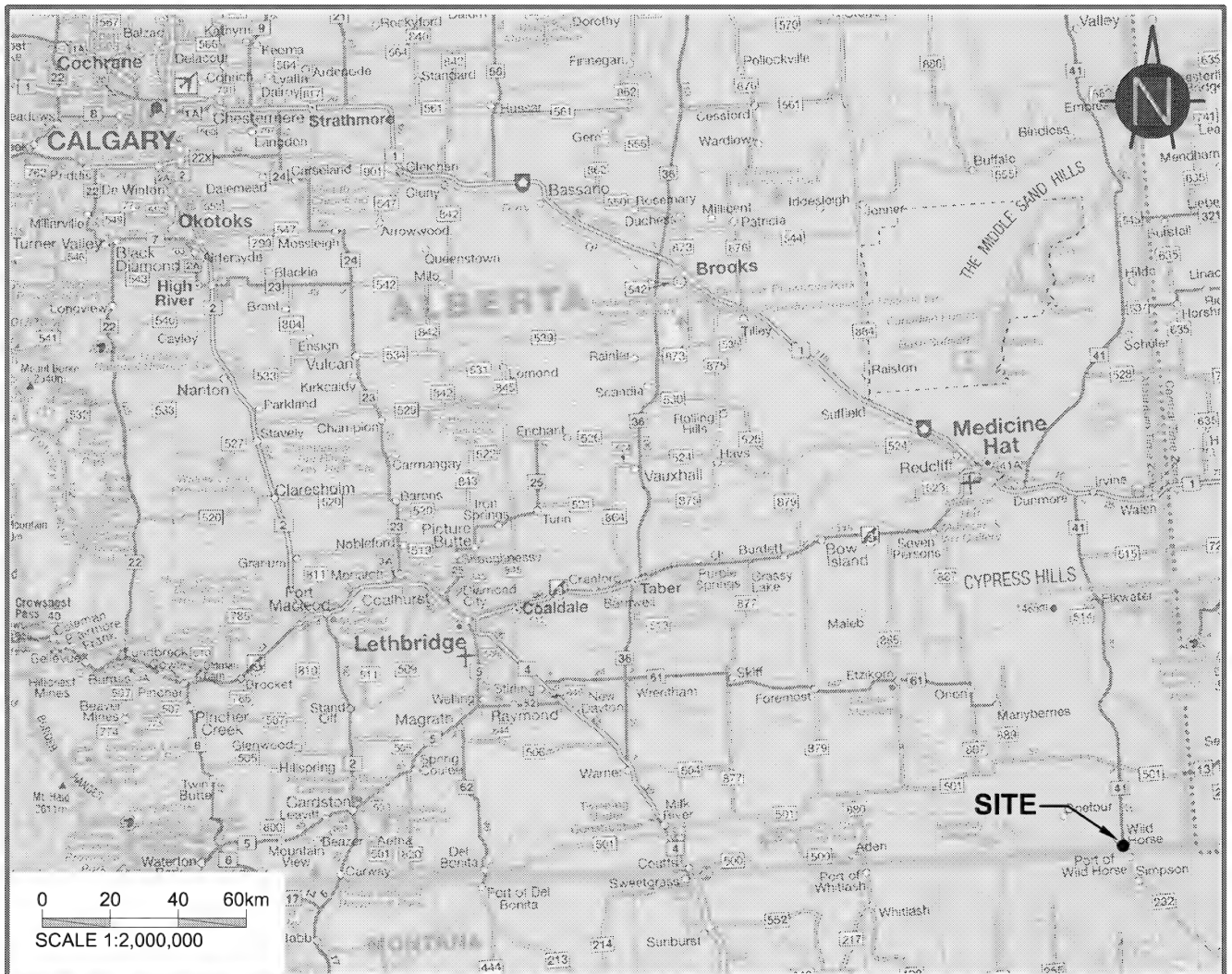
1. EGE Engineering Ltd. Public Works and Government Services Canada - Request for Proposal, Site-Specific Potable Water Risk Assessments at Prairie Border Crossing Facilities - Aden and Wild Horse, Alberta, October 2012.
2. Canada Border Services Agency. Terms of Reference, Site-Specific Potable Water Risk-Assessments at Prairie Border Crossing Facilities, July 2012.
3. Health Canada. Guidance for Providing Safe Drinking Water in Areas of Federal Jurisdiction, Version 2, December 18, 2009.
4. Health Canada. Guidelines for Canadian Drinking Water Quality Summary Table, August 2012.
5. Canada Border Services Agency. Description of the Risk-Based Database Evaluation Tool for Potable Water Management - CBSA, December, 2011.
6. Wardrop Engineering Inc. Wastewater Treatment System Assessments, CCRA Border Crossings, May, 2002.
7. EGE Engineering Ltd. Petroleum and Allied Containing Products Storage Tank Compliance Audit, Agriculture and Agri-Food Canada, Onefour Research Substation, Alberta, March 2011.

FIGURES

8.5" x 11"

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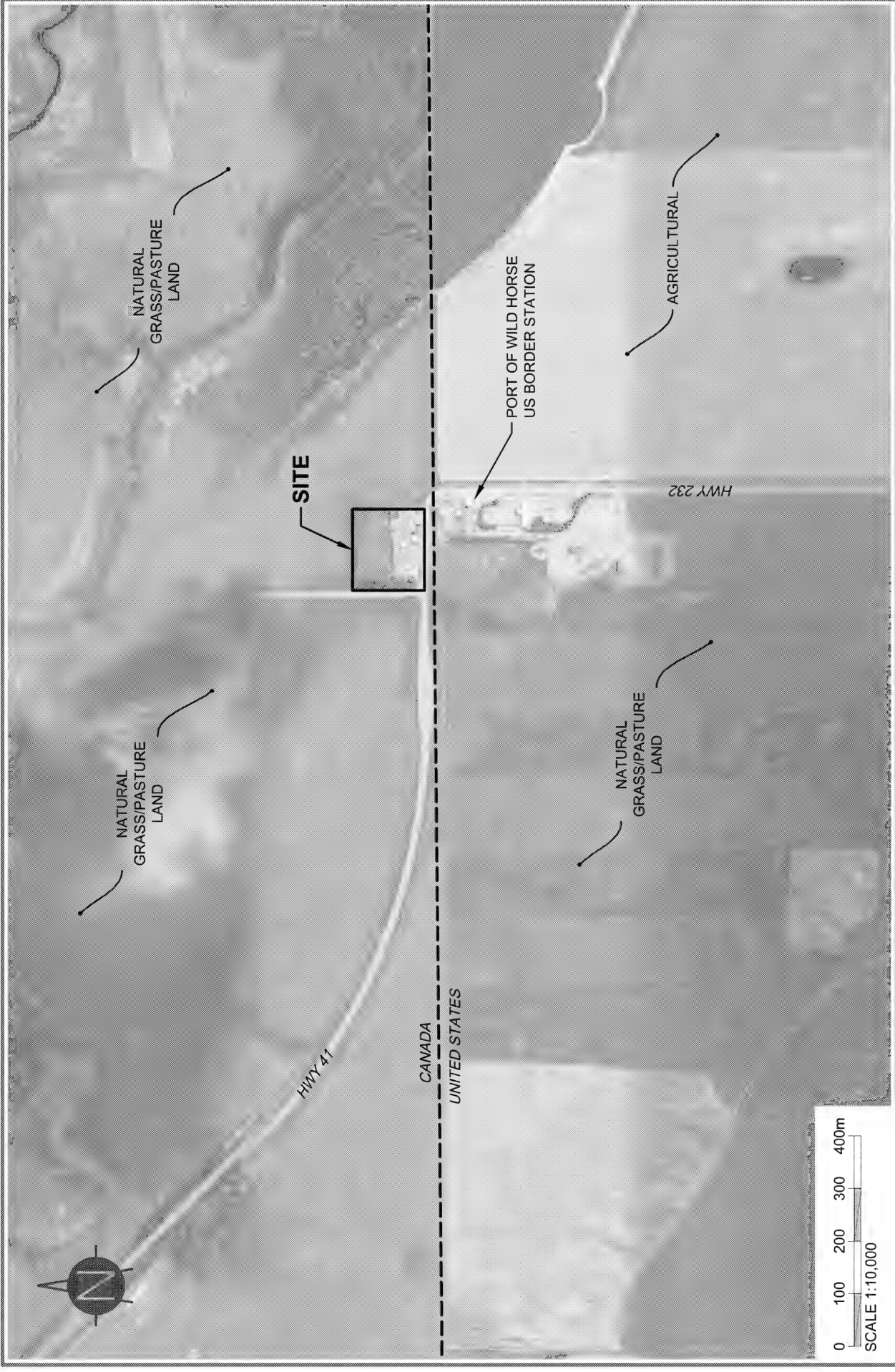


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Location
Plan

Figure 01

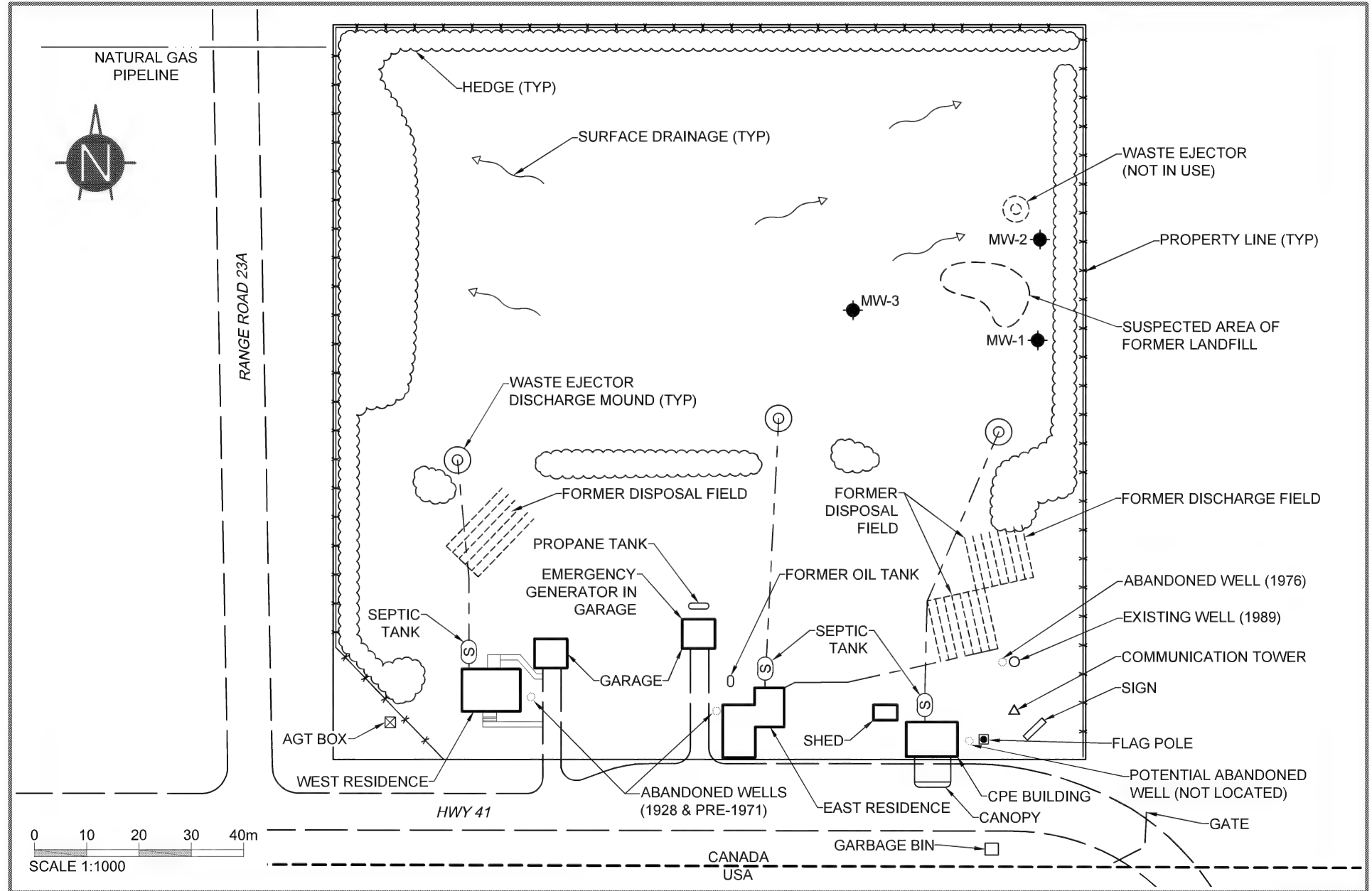


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**Surrounding
 Land Use**

Figure 02

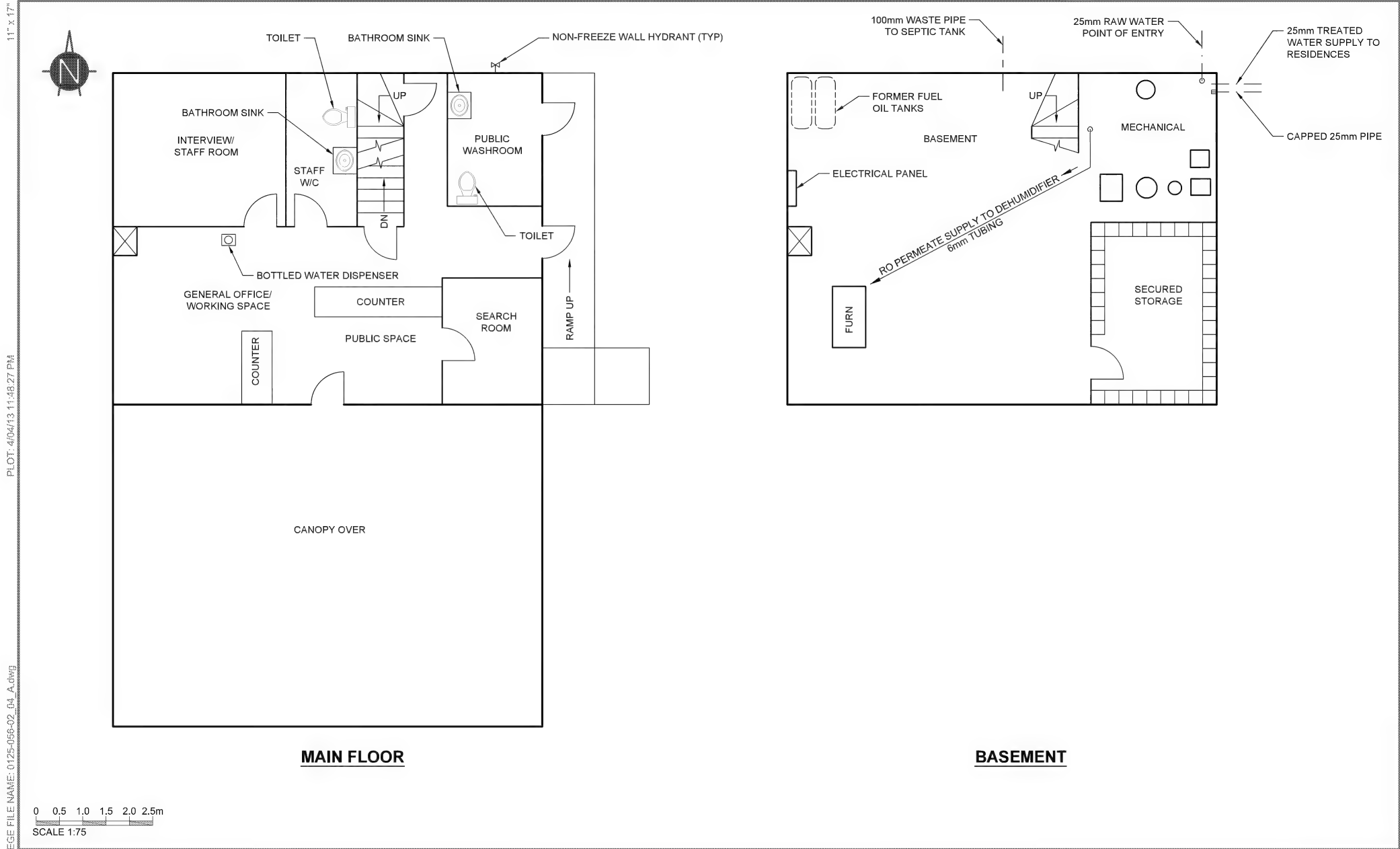


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Site Plan

Figure 03

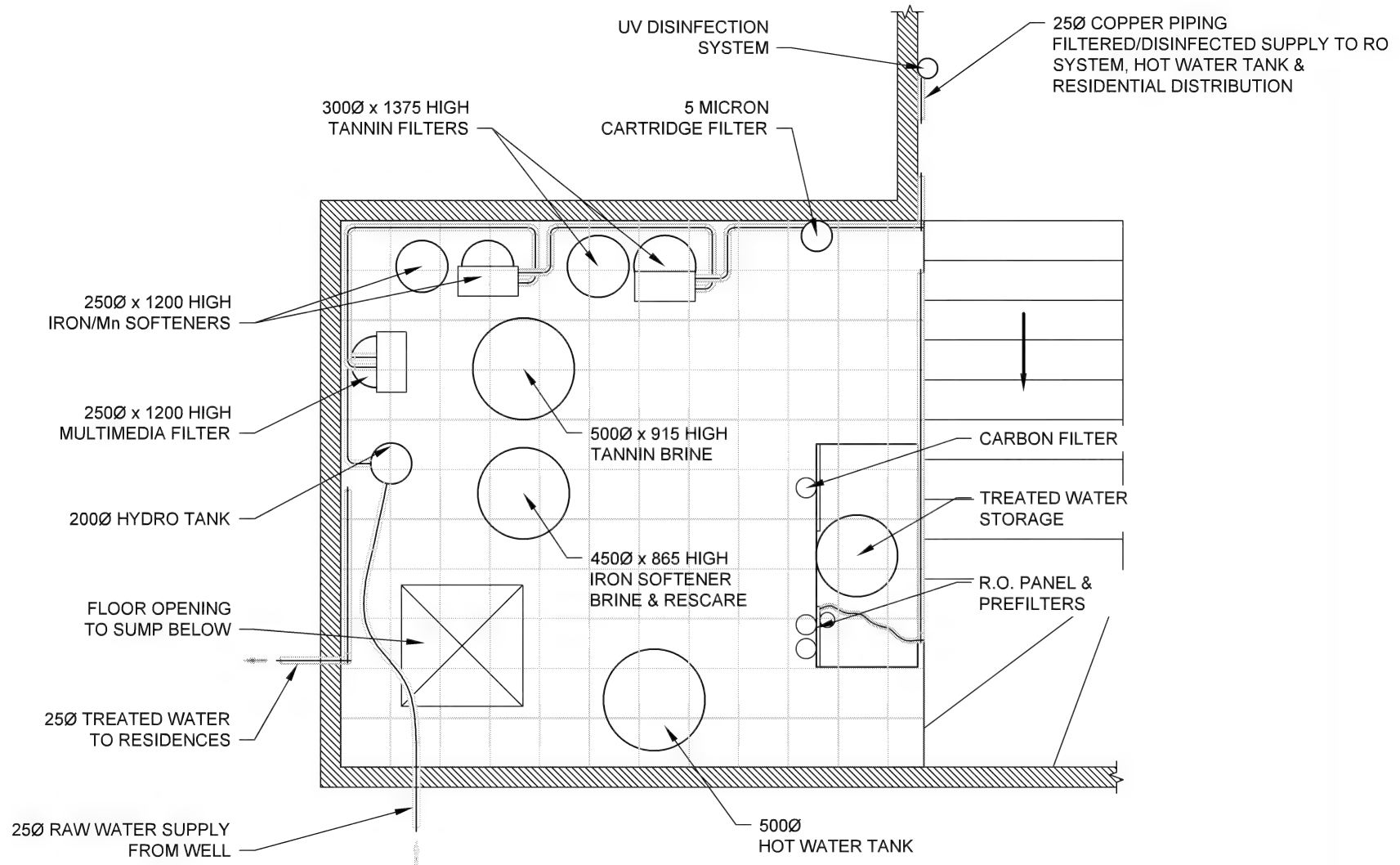


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 Wild Horse Border Crossing Facility, Alberta
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CPE Building
 Floor Plan

Figure 04

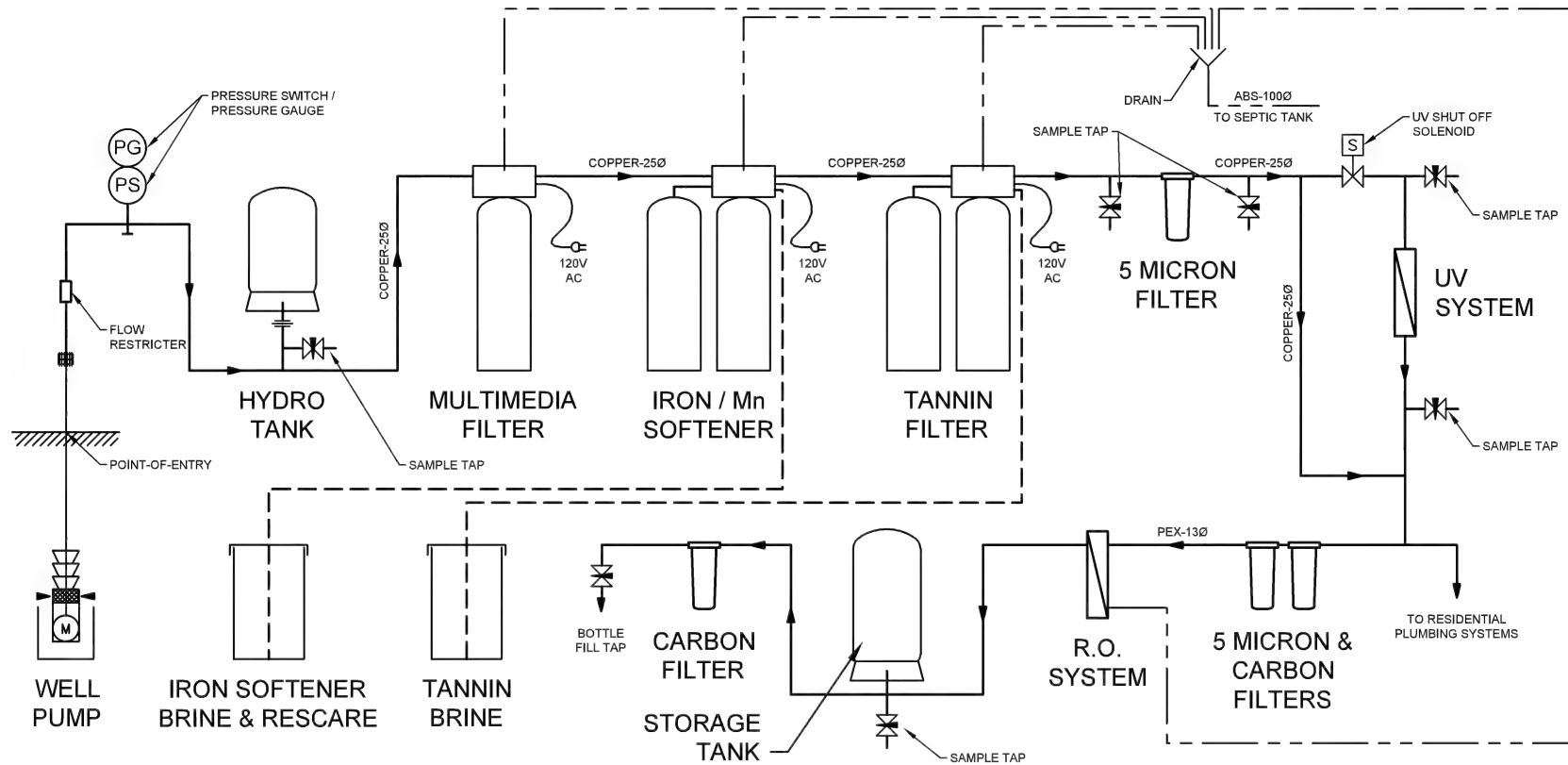


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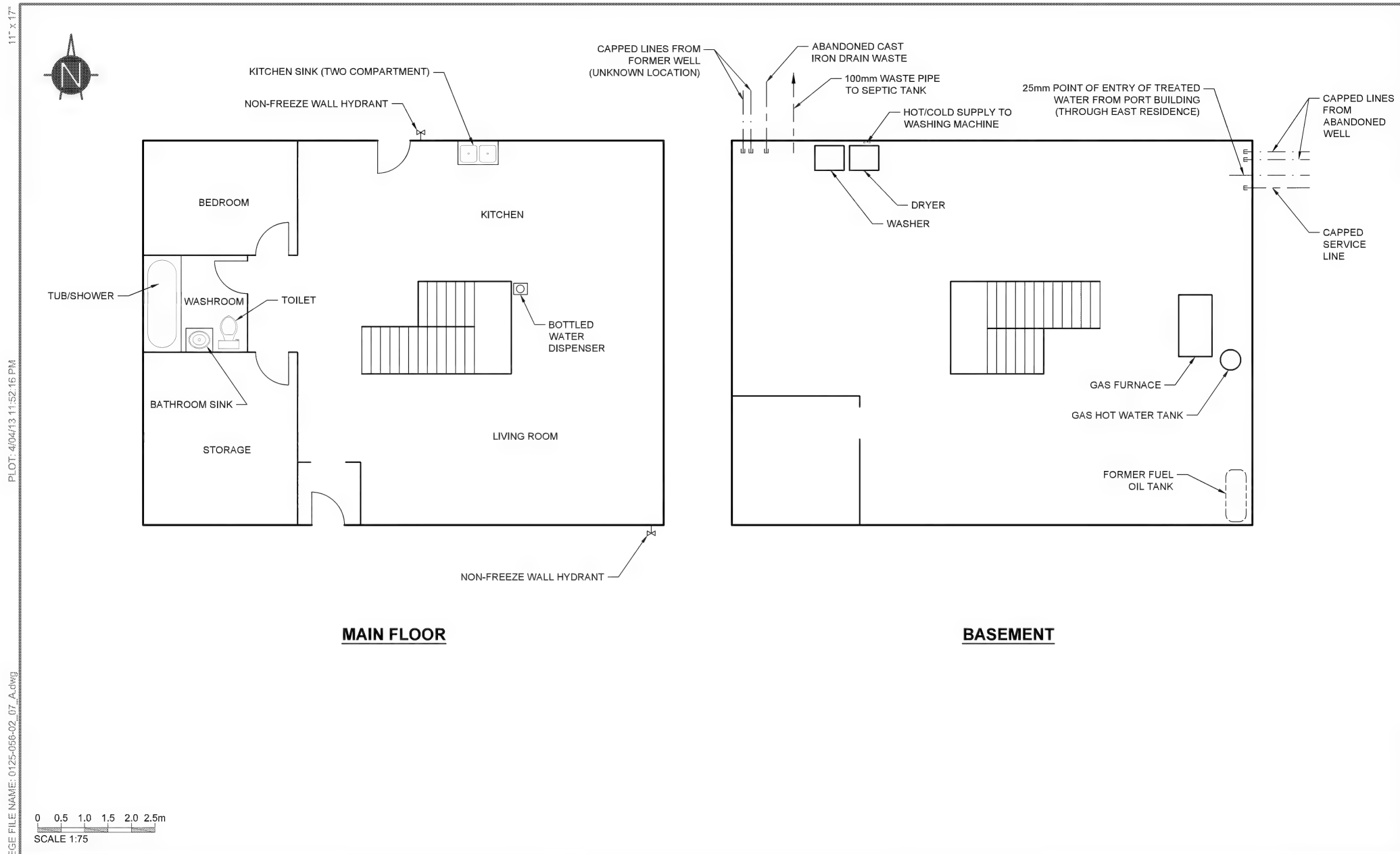
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Water Treatment
 Area

Figure 05



| WELL PUMP | HYDRO TANK | MULTIMEDIA FILTER | IRON GUARD SOFTENER | TANNIN FILTER |
|--------------------------|----------------------------|-----------------------|------------------------|----------------------------|
| TYPE: SUBMERSIBLE | TYPE: HYDRO-PNEUMATIC | TYPE: PRESSURE | TYPE: PRESSURE | TYPE: PRESSURE |
| MANUF: GOULDS | DIM: 200Ø x 300 | DIM: 250Ø x 1200 | DIM: 250Ø x 1200 | DIM: 300Ø x 1350 |
| MAKE: 7LS05412 | MANUF: FLEXCON IND. | MEDIA: SAND?? | MEDIA: RESIN | MEDIA: RESIN |
| SIZE: 100 mm | MODEL: PJR 6 | MANUF: NOVATEK | MANUF: NOVO | MANUF: NOVO |
| CAP.: X.XX L/s @ XXX.X m | MAX PR: 125 PSI | MODEL: NMMF10 | MODEL: CDA-30-1TD-2TX | MODEL: COD-20-75TD-2TS-850 |
| POWER: 0.5 hp | CAP: 8.0 L | VALVE: FLECK 2150 ?? | VALVE: FLECK 3200 ?? | VALVE: FLECK 3200 ?? |
| NOTES: 230V/1Ø | | | | |
| UV SYSTEM | R.O. SYSTEM | STORAGE TANK | BRINE TANK | |
| MANUF: STERILIGHT | MANUF: WATERGROUP | TYPE: HYDRO-PNEUMATIC | TYPE: POLYETHYLENE | |
| MODEL: SCM-320 | MODEL: WGR-300 | DIM: 400Ø x 1100 | CAP.: 160 L (45 USGAL) | |
| LAMP: S320RL-HO | ELEMENT: FILMTEC-TW30-2521 | MANUF: PENTAIR | | |
| SLEEVE: QS-320 | MOTOR: 0.33 HP | MODEL: WELL MATE 0120 | | |
| BALLAST: BA ICE-CM | FILTER: SEDIMENT / CARBON | MAX PR: 125 PSI | | |
| | | CAP: 112 L | | |

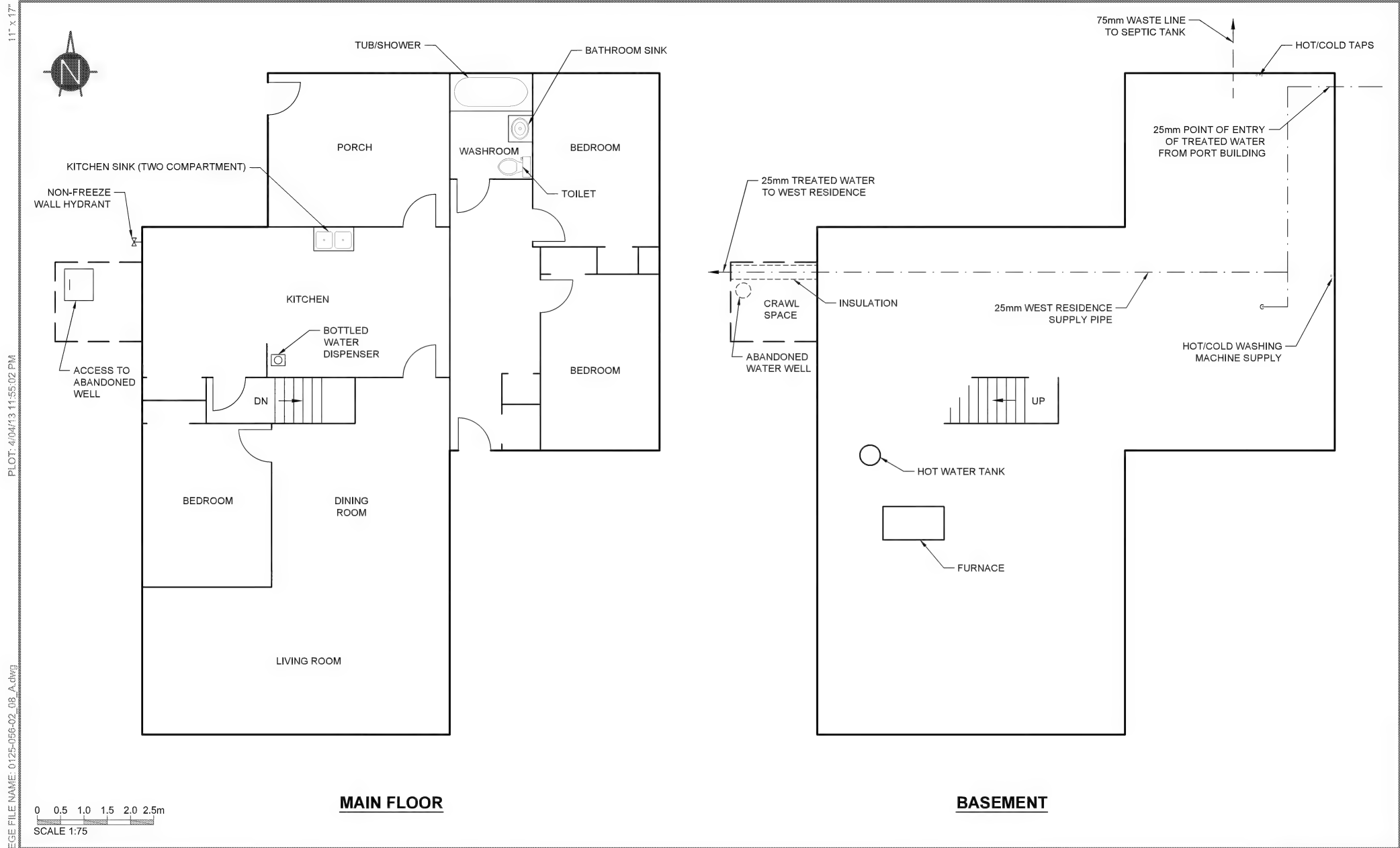


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West Residence
 Floor Plan

Figure 07



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East Residence
 Floor Plan

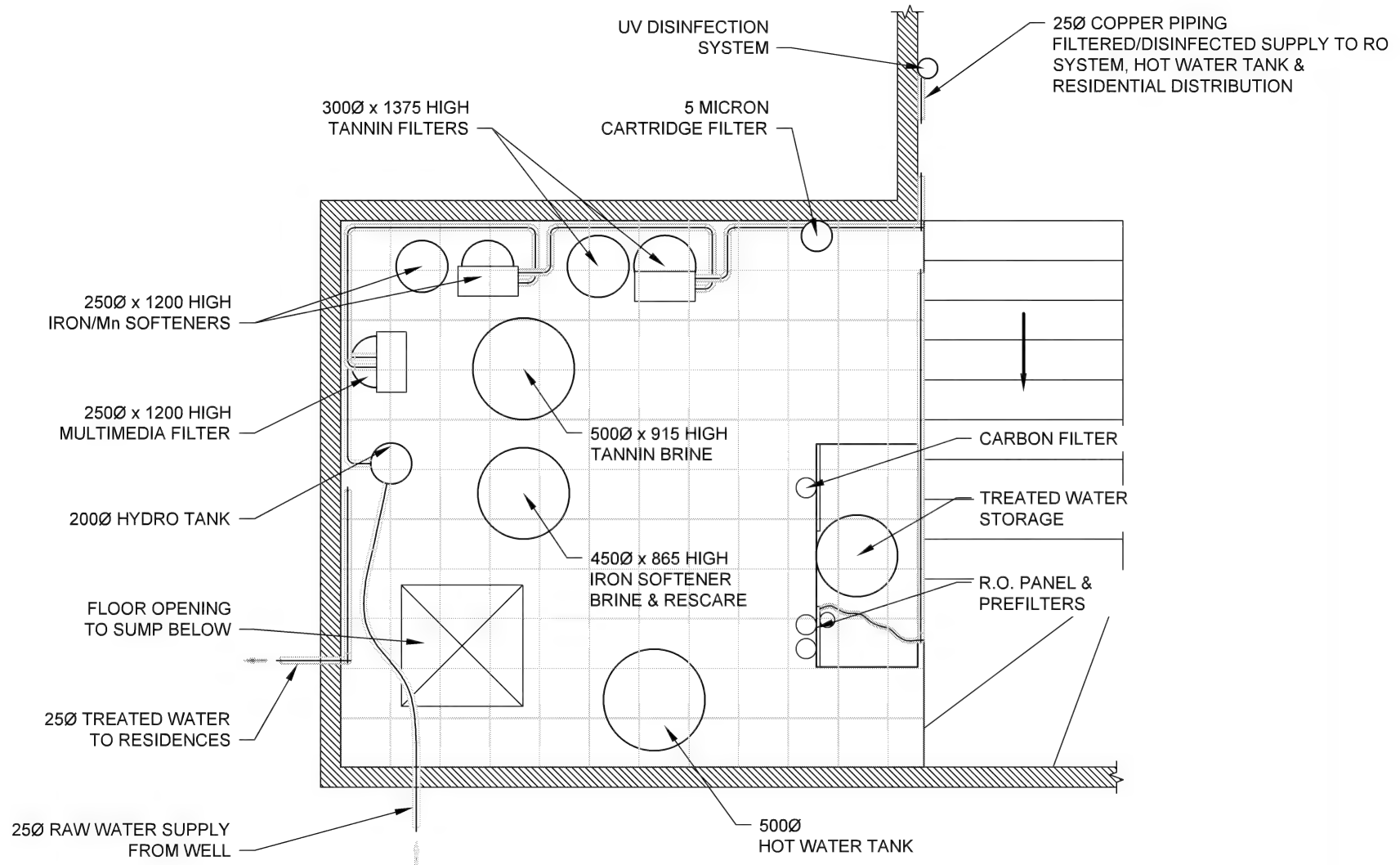
Figure 08

APPENDIX A OPERATING AND MAINTENANCE MANUAL

| | |
|-----------|---|
| 1 | Standard Operating Procedures Drawings - Plans |
| 2 | Raw Water Pumping Systems |
| 3 | Multimedia Filter Equipment |
| 4 | Iron Guard Softener Equipment |
| 5 | Tannin Removal Softener Equipment |
| 6 | Reverse Osmosis Equipment |
| 7 | Ultraviolet Light Disinfection Equipment |
| 8 | Miscellaneous Equipment |
| 9 | Bottled Water Equipment Sanitization Method |
| 10 | Maintenance Logs |





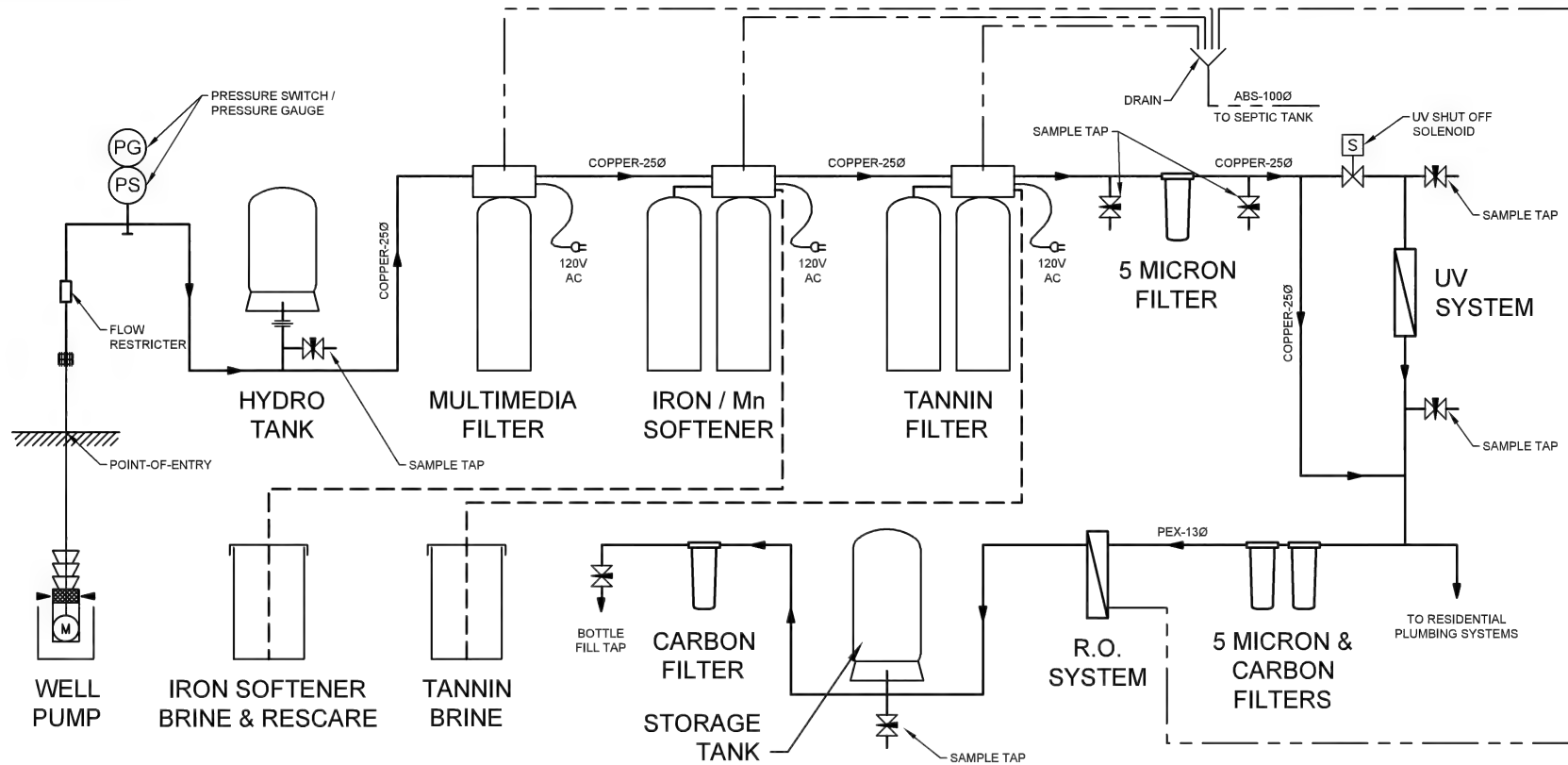


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Water Treatment
 Area

Figure 05



| WELL PUMP | HYDRO TANK | MULTIMEDIA FILTER | IRON GUARD SOFTENER | TANNIN FILTER |
|--------------------------|----------------------------|-----------------------|------------------------|----------------------------|
| TYPE: SUBMERSIBLE | TYPE: HYDRO-PNEUMATIC | TYPE: PRESSURE | TYPE: PRESSURE | TYPE: PRESSURE |
| MANUF: GOULDS | DIM: 200Ø x 300 | DIM: 250Ø x 1200 | DIM: 250Ø x 1200 | DIM: 300Ø x 1350 |
| MAKE: 7LS05412 | MANUF: FLEXCON IND. | MEDIA: SAND?? | MEDIA: RESIN | MEDIA: RESIN |
| SIZE: 100 mm | MODEL: PJR 6 | MANUF: NOVATEK | MANUF: NOVO | MANUF: NOVO |
| CAP.: X.XX L/s @ XXX.X m | MAX PR: 125 PSI | MODEL: NMMF10 | MODEL: CDA-30-1TD-2TX | MODEL: COD-20-75TD-2TS-850 |
| POWER: 0.5 hp | CAP: 8.0 L | VALVE: FLECK 2150 ?? | VALVE: FLECK 3200 ?? | VALVE: FLECK 3200 ?? |
| NOTES: 230V/1φ | | | | |
| UV SYSTEM | R.O. SYSTEM | STORAGE TANK | BRINE TANK | |
| MANUF: STERILIGHT | MANUF: WATERGROUP | TYPE: HYDRO-PNEUMATIC | TYPE: POLYETHYLENE | |
| MODEL: SCM-320 | MODEL: WGR-300 | DIM: 400Ø x 1100 | CAP.: 160 L (45 USGAL) | |
| LAMP: S320RL-HO | ELEMENT: FILMTEC-TW30-2521 | MANUF: PENTAIR | | |
| SLEEVE: QS-320 | MOTOR: 0.33 HP | MODEL: WELL MATE 0120 | | |
| BALLAST: BA ICE-CM | FILTER: SEDIMENT / CARBON | MAX PR: 125 PSI | | |
| | | CAP: 112 L | | |

| VALVE SCHEDULE | | |
|---|-----------------|---|
| OPERATION & MAINTENANCE MANUAL | | |
| CANADA CUSTOMS & REVENUE AGENCY, WILDHORSE BORDER CROSSING | | |
| VALVE NO. | BUILDING | VALVE TYPE, LOCATION, PURPOSE |
| 1 | OFFICE | BALL VALVE, EAST WALL, CONTROLS WATER SUPPLY TO SERVICE LINE TO BOTH HOUSES |
| 2 | OFFICE | HOSE BIBB, ABOVE PUMP CONTROLLER, TEST POINT TO TEST WELL WATER SAMPLE |
| 3 | OFFICE | BALL VALVE, ABOVE PUMP CONTROLLER, CONTROLS WATER SUPPLY TO THE ENTIRE WATER DISTRIBUTION SYSTEM SERVING OFFICE BUILDING AND BOTH HOUSES |
| 4 | OFFICE | HOSE BIBB, POST MULTI MEDIA FILTER, USED TO TEST WATER AFTER MULTI MEDIA FILTER |
| 5 | OFFICE | BALL VALVE, EAST WALL, CONTROLS WATER TO THE REAR LAWN SERVICE VALVE |
| 6 | OFFICE | HOSE BIBB, POST NOVO TANNINS REMOVAL WATER SOFTENER, USED TO TEST WATER AFTER THE TANNINS REMOVAL WATER SOFTENER |
| 6A | OFFICE | BALL VALVE, INLET SIDE OF PENTEK SUMP FILTER, USED TO ISOLATE SUMP FILTER WHEN REPLACING THE SEDIMENT CARTRIDGE |
| 7 | OFFICE | HOSE BIBB, POST PENTEK SUMP FILTER, USED TO SERVICE THE WATER FILTER |
| 7A | OFFICE | BALL VALVE, OUTLET SIDE OF PENTEK SUMP FILTER, USED TO ISOLATE SUMP FILTER WHEN REPLACING THE SEDIMENT CARTRIDGE |
| 8 | OFFICE | BALL VALVE, CENTER WALL, USED FOR EMERGENCY BYPASS ON THE ULTRA VIOLET STERILIZER |
| 9 | OFFICE | BALL VALVE, CENTER WALL, CONTROLS WATER SUPPLY TO THE ULTRA VIOLET STERILIZER |
| 10 | OFFICE | HOSE BIBB, CENTER WALL, USED TO DRAIN UV STERILIZER WHEN SERVICING THE UV STERILIZER |
| 11 | OFFICE | HOSE BIBB, CENTER WALL, USED AS A VENT & FOR PURGING WHEN SERVICING THE UV STERILIZER |
| 12 | OFFICE | BALL VALVE, CENTER WALL, USED TO ISOLATE UV STERILIZER ON EMERGENCY BYPASS |
| 13 | OFFICE | BALL VALVE, SOUTH WALL, USED TO CONTROL WATER SUPPLY TO OFFICE BLDG AND RO SYSTEM |
| 14 | OFFICE | BALL VALVE, SOUTH WALL, USED TO CONTROL WATER SUPPLY TO REVERSE OSMOSIS SYSTEM |
| 15 | OFFICE | BALL VALVE, ABOVE WATER HEATER, CONTROLS COLD WATER SUPPLY TO WATER HEATER |
| 16 | OFFICE | BALL VALVE, ABOVE WATER HEATER, CONTROLS COLD WATER SUPPLY TO MAIN FLOOR FIXTURES |
| 17 | OFFICE | BALL VALVE, ABOVE WATER HEATER, CONTROLS HOT WATER SUPPLY TO MAIN FLOOR FIXTURES |
| 18 | OFFICE | BALL VALVE, LEFT SIDE OF CARBON FILTER ON RO SYSTEM, USED TO FILL WATER BOTTLES |
| 19 | OFFICE | BALL VALVE, RIGHT SIDE OF CARBON FILTER ON RO SYSTEM, USED TO CHANGE FILTER CARTRIDGE |
| 20 | OFFICE | BALL VALVE, ON PRESS TANK ON RO SYSTEM, SOMETIMES USED TO FAST FLUSH RO MEMBRANE |
| 21 | OFFICE | BALL VALVE, ON PRESSURE TANK ON RO SYSTEM, USED TO DRAIN RO SYSTEM PRESSURE TANK |
| 22 | OFFICE | BALL VALVE, ON BACK SIDE OF RO SYSTEM, USED TO FAST FLUSH MEMBRANE ON RO SYSTEM |
| 23 | OFFICE | SADDLE VALVE, EAST WALL, THIS VALVE IS NOT USED, IT WAS ORIGINALLY USED TO RUN WATER TO DRAIN THROUGH A 1/4" POLYETHYLENE TUBE AT THE RATE OF ONE DROP PER SECOND. THIS PREVENTED OVER HEATING OF THE WATER IN THE ORIGINAL OBSOLETE WEDECO ULTRA VIOLET STERILIZER WHEN WATER WAS NOT BEING USED FOR EXTENDED PERIODS OF TIME (E.G. OVER NIGHT). THE ORIGINAL WEDECO ULTRA VIOLET STEIRLIZER WOULD GO INTO A FALSE ALARM MODE WHEN THE WATER INSIDE IT WAS TOO WARM. |
| 24 | EAST HOUSE | BALL VALVE, CEILING AT BOTTOM OF BASEMENT STAIRS, CONTROLS WATER SUPPLY TO THE EAST HOUSE |
| 25 | EAST HOUSE | GATE VALVE, NORTH WEST CORNER OF THE BASEMENT, 12" ABOVE THE BASEMENT FLOOR, ON THE RIGHT SIDE OF THE OLD PUMP ROOM DOOR, CONTROLS WATER SUPPLY TO THE UNDERGROUND WATER SERVICE LINE TO THE WEST HOUSE |
| 26 | WEST HOUSE | GATE VALVE, NORTH EAST CORNER OF BASEMENT, CONTROLS WATER SUPPLY TO THE WEST HOUSE |
| Stenger's Plumbing & Heating Ltd, 19 Rossland Drive SE, Medicine Hat, Alberta, T1A 2B5, Phone: 403-526-2251, Fax: 403-529-9316, E-mail: stengers@telusplanet.net | | |

SERVICING!

WHAT?

REGULAR MAINTENANCE AND SERVICE ON WATER CONDITIONING EQUIPMENT, WATER PURIFICATION EQUIPMENT AND HUMIDIFIERS.

WHERE?

CANADA CUSTOMS AND REVENUE AGENCY, WILDHORSE BORDER CROSSING, OFFICE BUILDING AND STAFF HOUSES.

WHEN?

ON REGULAR BASIS AS OUTLINED IN FOLLOWING INSTRUCTION SHEETS.

WHY?

TO MAINTAIN EQUIPMENT SO THAT IT PERFORMS AS DESIGNED. THIS WILL PREVENT UNDUE WEAR ON THE EQUIPMENT AND WILL PROVIDE A SAFE POTABLE WATER SYSTEM.

WHO?

**ON-SITE OFFICERS STATIONED AT THE BORDER CROSSING AND CONTRACT CLEANING STAFF.
NOTE: ANNUAL FULL SERVICES WILL BE PROVIDED BY STENGER'S PLUMBING & HEATING LTD AS ARRANGED WITH CALGARY OFFICE.**

HOW?

REGULAR SERVICING TO BE DONE AS OUTLINED ON THE FOLLOWING 8 SERVICE INSTRUCTION SHEETS:

NOVATEK MULTI MEDIA FILTER:

SETTING THE CLOCK:

- IF THERE IS A POWER OUTAGE IT WILL CAUSE THE CLOCK TO BE SLOW.
- IT IS VERY IMPORTANT THAT THE TIME ON THE CLOCK IS CURRENT SO THE SOFTENER REGENERATES AT THE CORRECT TIME.
- SET THE CLOCK AS FOLLOWS:
 - LOOSEN THE TWO THUMB SCREWS LOCATED ON THE SIDES OF THE VALVE COVER.
 - REMOVE THE COVER FROM THE VALVE.
 - FOLLOW “SETTING THE 24-HOUR TIMER” INSTRUCTIONS ON PAGE 4 OF THE “NOVATEK AUTOMATIC WATER FILTERS OPERATION MANUAL” IN SECTION 6 OF THE SERVICE BINDER.
 - PUT THE VALVE COVER IN PLACE AND TIGHTEN THE ¼” HEX HEAD SCREWS ON THE SIDES OF THE COVER.

NOVO DUPLEX WATER SOFTENER:

SETTING THE CLOCK:

- IF THERE IS A POWER OUTAGE IT WILL CAUSE THE CLOCK TO BE SLOW.
- SET THE CLOCK AS FOLLOWS:
 - LOOSEN THE TWO THUMB SCREWS LOCATED ON THE SIDES OF THE VALVE COVER.
 - REMOVE THE COVER FROM THE VALVE.
 - FOLLOW "SETTING THE TIME OF DAY" INSTRUCTIONS ON PAGE 6 OF THE "XT SERVICE MANUAL" IN SECTION 7 OF THE SERVICE BINDER.
 - PUT THE VALVE COVER IN PLACE AND TIGHTEN THE THUMB SCREWS ON THE SIDES OF THE COVER.

SALT IN BRINE TANK:

- ENSURE THAT THERE IS A MINIMUM OF TWO 20 KG BAGS OF SALT IN THE BRINE TANK.
- IF YOU NOTICE THAT THERE IS NO SALT IN THE BRINE TANK DO THE FOLLOWING:
- ADD AT LEAST ONE 20 KG BAG OF SOFTENER SALT.
- WAIT AT LEAST 4 HOURS FOR ENOUGH SALT TO DISSOLVE TO MAKE A STRONG ENOUGH BRINE SOLUTION TO ADEQUATELY REGENERATE THE SOFTENER.
- AFTER A MINIMUM OF 4 HOURS PUT THE SOFTENER INTO A MANUAL REGENERATION AS FOLLOWS:
 - FIRST MEDIA TANK:
 - LOOSEN THE TWO THUMB SCREWS LOCATED ON THE SIDES OF THE VALVE COVER.
 - REMOVE THE COVER FROM THE VALVE.
 - FOLLOW THE "MANUALLY INITIATING A REGENERATION" INSTRUCTIONS ON PAGE 6 OF THE "XT SERVICE MANUAL" IN SECTION 7 OF THE SERVICE BINDER.
 - PUT THE VALVE COVER IN PLACE AND TIGHTEN THE THUMB SCREWS ON THE SIDES OF THE COVER.
 - SECOND MEDIA TANK:
 - AFTER THE FIRST MEDIA TANK HAS REGENERATED YOU HAVE TO WAIT FOR AT LEAST 4 HOURS FOR ENOUGH SALT TO DISSOLVE TO MAKE A STRONG ENOUGH BRINE SOLUTION TO ADEQUATELY REGENERATE THE SECOND TANK.
 - AFTER A MINIMUM OF 4 HOURS PUT THE SOFTENER INTO A MANUAL REGENERATION, FOLLOW THE SAME INSTRUCTIONS AS FOR THE FIRST MEDIA TANK.

RES-UP FEEDER ON BRINE TANK:

- ENSURE THAT THERE IS ALWAYS RES-CARE SOLUTION IN THIS FEEDER.
- DO NOT FILL ANY HIGHER THAN THE MARK AT THE TOP OF THE FEEDER.

NOVO DUPLEX TANNINS REMOVAL WATER SOFTENER:

SETTING THE CLOCK:

- IF THERE IS A POWER OUTAGE IT WILL CAUSE THE CLOCK TO BE SLOW.
- SET THE CLOCK AS FOLLOWS:
 - LOOSEN THE TWO THUMB SCREWS LOCATED ON THE SIDES OF THE VALVE COVER.
 - REMOVE THE COVER FROM THE VALVE.
 - FOLLOW "SETTING THE TIME OF DAY" INSTRUCTIONS ON PAGE 6 OF THE "XT SERVICE MANUAL" IN SECTION 7 OF THE SERVICE BINDER.
 - PUT THE VALVE COVER IN PLACE AND TIGHTEN THE THUMB SCREWS ON THE SIDES OF THE COVER.

SALT IN BRINE TANK:

- ENSURE THAT THERE IS A MINIMUM OF TWO 20 KG BAGS OF SALT IN THE BRINE TANK.
- IF YOU NOTICE THAT THERE IS NO SALT IN THE BRINE TANK DO THE FOLLOWING:
- ADD AT LEAST ONE 20 KG BAG OF SOFTENER SALT.
- WAIT AT LEAST 4 HOURS FOR ENOUGH SALT TO DISSOLVE TO MAKE A STRONG ENOUGH BRINE SOLUTION TO ADEQUATELY REGENERATE THE SOFTENER.
- AFTER A MINIMUM OF 4 HOURS PUT THE SOFTENER INTO A MANUAL REGENERATION AS FOLLOWS:
 - FIRST MEDIA TANK:
 - LOOSEN THE TWO THUMB SCREWS LOCATED ON THE SIDES OF THE VALVE COVER.
 - REMOVE THE COVER FROM THE VALVE.
 - FOLLOW THE "MANUALLY INITIATING A REGENERATION" INSTRUCTIONS ON PAGE 6 OF THE "XT SERVICE MANUAL" IN SECTION 7 OF THE SERVICE BINDER.
 - PUT THE VALVE COVER IN PLACE AND TIGHTEN THE THUMB SCREWS ON THE SIDES OF THE COVER.
 - SECOND MEDIA TANK:
 - AFTER THE FIRST MEDIA TANK HAS REGENERATED YOU HAVE TO WAIT FOR AT LEAST 4 HOURS FOR ENOUGH SALT TO DISSOLVE TO MAKE A STRONG ENOUGH BRINE SOLUTION TO ADEQUATELY REGENERATE THE SECOND TANK.
 - AFTER A MINIMUM OF 4 HOURS PUT THE SOFTENER INTO A MANUAL REGENERATION, FOLLOW THE SAME INSTRUCTIONS AS FOR THE FIRST MEDIA TANK.

RES-UP FEEDER ON BRINE TANK:

- ENSURE THAT THERE IS ALWAYS RES-CARE SOLUTION IN THIS FEEDER.
- DO NOT FILL ANY HIGHER THAN THE MARK AT THE TOP OF THE FEEDER.

PENTEK SUMP FILTER LOCATED DOWNSTREAM OF THE NOVO DUPLEX TANNINS REMOVAL WATER SOFTENER:

- **REPLACE THIS FILTER MONTHLY OR SOONER IF REQUIRED. YOU CAN CONFIRM THAT IT SHOULD BE REPLACED SOONER BY TESTING AS FOLLOWS:**
 - **THERE'S A PRESSURE DIFFERENTIAL NEEDLE GAUGE LOCATED ON THE TOP OF THIS FILTER.**
 - **RUN COLD WATER AT A BASIN FAUCET AND CHECK THE NEEDLE GAUGE READING. IT WILL INDICATE THE CONDITION OF THE CARTRIDGE.**
- **REPLACE THE FILTER AS FOLLOWS:**
 - **PLACE A 20-LITER BUCKET ON THE FLOOR BELOW THE WATER FILTER TO CATCH SPILLED WATER.**
 - **CLOSE BALL VALVE 9 ON THE INLET SIDE OF THE ULTRA VIOLET STERILIZER.**
 - **CLOSE BALL VALVES 6A AND 7A TO ISOLATE THE SUMP FILTER FROM THE WATER DISTRIBUTION SYSTEM.**
 - **PUSH DOWN ON THE RED PRESSURE RELEASE BUTTON LOCATED ON TOP OF THE FILTER BEHIND THE NEEDLE GAUGE.**
 - **USE THE BLACK SPANNER WRENCH (HANGING ON THE WALL BESIDE THE FILTER) TO LOOSEN THE SUMP. PUT THE WRENCH ON THE FILTER WITH THE HANDLE POINTING TO THE RIGHT SIDE OF THE SUMP AND PULL THE HANDLE TOWARDS YOURSELF. PULL FIRMLY; DON'T JERK ON THE HANDLE! WHILE PULLING ON THE HANDLE WITH YOUR RIGHT HAND, HOLD AGAINST THE SUMP WITH YOUR LEFT HAND TO STEADY THE FILTER ASSEMBLY.**
 - **AFTER THE SUMP IS LOOSENED YOU CAN REMOVE IT BY HAND WITHOUT THE USE OF THE WRENCH.**
 - **TIP THE SUMP OVER POURING THE WATER AND THE OLD FILTER INTO THE 20-LITER BUCKET.**
 - **RINSE THE SUMP USING WATER FROM THE TEST POINT VALVE #6 LOCATED TO THE LEFT OF THE WATER FILTER AND POUR THE WATER INTO THE 20-LITER BUCKET.**
 - **CLEAN THE OLD SILICONE GREASE OFF THE O-RING AND THE FILTER HOUSING USING A SHOP TOWEL.**
 - **APPLY A "LIGHT" COATING OF SILICONE GREASE (SUPPLIED IN BROWN VIAL) ON THE SUMP O-RING.**
 - **FILL THE SUMP 1/3 FULL OF WATER AND ADD TWO TABLESPOONS OF HOUSEHOLD BLEACH TO THE WATER. THOROUGHLY SCRUB THE INTERIOR OF THE SUMP WITH A BRUSH OR SPONGE AND THEN RINSE THOROUGHLY.**
 - **ADD TWO TABLESPOONS OF HOUSEHOLD BLEACH TO THE SUMP FILTER.**
 - **TEAR THE WRAPPING OFF ONE END OF A NEW 5-MICRON SEDIMENT FILTER BEING CAREFUL NOT TO CONTAMINATE THE FILTER BY TOUCHING IT WITH YOUR HANDS.**
 - **INSERT THE 5 MICRON SEDIMENT FILTER INTO THE SUMP WHILE HOLDING THE OUTSIDE OF THE PAPER WRAPPING SO YOUR HAND DOES NOT TOUCH AND CONTAMINATE THE FILTER. REMOVE THE BALANCE OF THE WRAPPING FROM THE FILTER AS YOU INSERT IT INTO THE SUMP**
 - **INSTALL THE SUMP BY HAND AND "JUST MAKE IT SNUG". DO NOT USE A WRENCH TO TIGHTEN THE SUMP OR IT WILL BE NEARLY IMPOSSIBLE TO REMOVE IT THE NEXT TIME THE FILTER HAS TO BE CHANGED.**
 - **"SLOWLY" OPEN VALVE 6A TO ALLOW WATER TO ENTER THE FILTER SUMP AND "PRESSURE UP".**
 - **CHECK FOR LEAKS ON THE FILTER O-RING.**
 - **LEAVE THE SYSTEM IN THIS POSITION FOR TWENTY MINUTES TO ALLOW THE TWO TABLESPOONS OF BLEACH TO "WORK".**
 - **HOLD THE 20-LITER BUCKET IN PLACE UNDER VALVE 7.**

- **SLOWLY OPEN VALVE 7A TO FLUSH THE BLEACH WATER FROM THE SUMP INTO THE BUCKET. “BE CAREFUL NOT TO ALLOW THE BLEACH WATER TO SPLASH ONTO YOUR BODY, ESPECIALLY INTO YOUR EYES!”**
- **CLOSE VALVE 7 AFTER FLUSHING THE BLEACH FROM THE FILTER SUMP.**
- **OPEN VALVE 9 TO PUT THE SYSTEM INTO OPERATION.**
- **RECORD THE DATE OF THE FILTER CHANGE IN THE WATER FILTER MAINTENANCE LOG.**

STERILIGHT COBALT ULTRA VIOLET STERILIZER:

- THE DISPLAY ON THIS ULTRA VIOLET STERILIZER SHOWS THE ULTRA VIOLET OUTPUT AS A PERCENTAGE. THE MAXIMUM OUTPUT READING IS 99%. THE SYSTEM IS EFFECTIVE WHEN THE OUTPUT IS BETWEEN 50% AND 99%. IF THE OUTPUT DROPS BELOW 50% THE SYSTEM WILL GO INTO THE ALARM MODE AND WILL CLOSE THE SOLENOID VALVE ON THE INLET SIDE OF THE ULTRA VIOLET STERILIZER. THIS WILL PREVENT SUPPLY WATER FROM PASSING THROUGH THE ULTRA VIOLET STERILIZER.
- THE MANUFACTURER RECOMMENDS THAT THE LAMP SHOULD BE REPLACED ANNUALLY. THE CONTROLLER TRACKS THE NUMBER OF DAYS OF OPERATION OF THE LAMP AND THE CONTROLLER. THE DEFAULT SCREEN WILL DISPLAY THE TOTAL LAMP LIFE REMAINING (IN DAYS). THE CONTROLLER WILL COUNT DOWN THE NUMBER OF DAYS REMAINING UNTIL THE LAMP REQUIRES CHANGING (365 DAYS TO 1 DAY). AT "0" DAYS THE CONTROLLER WILL DISPLAY "A3" ON THE DISPLAY AND WILL SUPPLY AN INTERMITTENT AUDIBLE CHIRP (1 SECOND ON, 5 SECONDS OFF), INDICATING THE NEED TO CHANGE THE LAMP.
- THE QUARTZ SLEEVE AND THE SENSOR EYE SHOULD BE CLEANED FOR THE FOLLOWING TWO REASONS:
 - IF THE WATER TREATMENT EQUIPMENT (MULTI MEDIA FILTER, WATER SOFTENER AND TANNINS REMOVAL WATER SOFTENER) FAILS, THE QUARTZ SLEEVE AND THE SENSOR EYE ON THE ULTRA VIOLET STERILIZER COULD BECOME DIRTY CAUSING THE ULTRA VIOLET STERILIZER TO GO INTO ALARM MODE.
 - WHEN THE LAMP IS REPLACED ANNUALLY (AFTER 365 DAYS OF USE).
- CLEAN THE QUARTZ SLEEVE AND SENSOR EYE AS FOLLOWS:
 - UNPLUG THE ULTRA VIOLET STERILIZER POWER CORD FROM THE SURGE SUPPRESSOR.
 - CLOSE BALL VALVES #9 AND #12.
 - PLACE SMALL BUCKET BELOW HOSE BIBB #10.
 - OPEN HOSE BIBB #10 TO DRAIN WATER FROM ULTRA VIOLET STERILIZER INTO BUCKET.
 - OPEN HOSE BIBB #11 TO ALLOW AIR INTO THE ULTRA VIOLET STERILIZER TO PREVENT AIR LOCKING SO ALL OF THE WATER WILL DRAIN FROM THE ULTRA VIOLET STERILIZER.
 - FOLLOW SERVICE AND CLEANING INSTRUCTIONS ON PAGES 8, 9, 10 AND 11 OF THE STERILIGHT COBALT MANUFACTURER'S MANUAL. (NOTE: THE MANUAL SAYS TO USE CLR OR LIME-A-WAY TO CLEAN THE QUARTZ SLEEVE AND THE SENSOR EYE. OUR EXPERIENCE INDICATES THAT ISOPROPYL ALCOHOL AND SHOP TOWELS CAN BE USED TO CLEAN THE QUARTZ SLEEVE AND ISOPROPYL ALCOHOL AND COTTON SWABS CAN BE USED TO CLEAN THE SENSOR EYE).
- AFTER THE QUARTZ SLEEVE AND SENSOR EYE HAVE BEEN CLEANED AND A NEW LAMP HAS BEEN INSTALLED (IF REQUIRED) THE ULTRA VIOLET STERILIZER SHOULD BE SANITIZED AND PUT BACK INTO OPERATION AS FOLLOWS:
 - SERVICE THE PENTEK SUMP FILTER AS DESCRIBED PREVIOUSLY IN THESE INSTRUCTIONS BUT ADD 1 CUP OF HOUSEHOLD BLEACH TO THE FILTER SUMP INSTEAD OF THE USUAL TWO TABLESPOONS.
 - SLOWLY OPEN VALVE 6A TO "PRESSURE UP" THE SUMP FILTER.
 - "DO NOT OPEN VALVE 7 THIS TIME BECAUSE WE WANT TO SEND THE BLEACH SOLUTION TO THE ULTRA VIOLET STERILIZER TO SANITIZE IT".
 - SLOWLY OPEN VALVE 7A TO ALLOW BLEACH SOLUTION TO FLOW TO VALVE 9.

- **“POWER UP” THE ULTRA VIOLET STERILIZER AS FOLLOWS:**
 - **IF YOU CLEANED THE QUARTZ SLEEVE AND SENSOR EYE BUT DID NOT DO AN ANNUAL LAMP REPLACEMENT JUST PLUG THE ULTRA VIOLET STERILIZER POWER CORD INTO THE SURGE SUPPRESSOR.**
 - **IF YOU CLEANED THE QUARTZ SLEEVE AND SENSOR AND REPLACED THE LAMP FOLLOW THE “RESETTING LAMP LIFE” INSTRUCTIONS ON PAGE 11 OF THE MANUFACTURER’S STERILIGHT COBALT MANUAL AND PLUG THE ULTRA VIOLET STERILIZER POWER CORD INTO THE SURGE SUPPRESSOR.**
- **CLOSE HOSE BIBB #10.**
- **CLOSE HOSE BIBB #11.**
- **SLOWLY OPEN BALL VALVE #9 ALLOWING THE BLEACH SOLUTION TO FLOW INTO THE ULTRA VIOLET STERILIZER. THE BLEACH SOLUTION WILL CAUSE THE WATER TO BECOME CLOUDY. THIS COULD CAUSE THE ULTRA VIOLET STERILIZER TO GO INTO ALARM MODE, CLOSE THE SOLENOID VALVE ON THE INLET SIDE OF THE ULTRA VIOLET STERILIZER AND DISPLAY THE “A2” CODE. IF THIS HAPPENS PUSH THE RESET BUTTON ON THE SIDE OF THE CONTROL BOX TO MANUALLY OPEN THE SOLENOID VALVE TO ALLOW THE BLEACH SOLUTION TO FILL THE ULTRA VIOLET STERILIZER.**
- **HOLD A 20-LITER BUCKET UNDER VALVE 11. SLOWLY OPEN VALVE 11 TO PURGE THE AIR FROM THE ULTRA VIOLET STERILIZER. “BE VERY CAREFUL NOT TO ALLOW THE STRONG BLEACH SOLUTION TO SPLASH ONTO YOUR BODY, ESPECIALLY INTO YOUR EYES”. CLOSE VALVE 11 WHEN YOU HAVE PURGED THE AIR FROM THE ULTRA VIOLET STERILIZER.**
- **LEAVE THE SYSTEM IN THIS STATE FOR 20 MINUTES TO ALLOW THE BLEACH SOLUTION “TO WORK”.**
- **AFTER 20 MINUTES HAVE PASSED PLACE A 20-LITER BUCKET UNDER VALVE 11. SLOWLY OPEN VALVE 11 AND FLUSH 20 LITERS OF WATER INTO THE BUCKET TO FLUSH THE BLEACH SOLUTION FROM THE SYSTEM. “BE VERY CAREFUL NOT TO SPLASH THE BLEACH SOLUTION ONTO YOUR BODY ESPECIALLY INTO YOUR EYES”.**
- **CLOSE VALVE 11 AFTER FLUSHING 20 LITERS OF BLEACH SOLUTION.**
- **DISPOSE OF THE BUCKET OF BLEACH SOLUTION BY POURING IT INTO THE FLOOR SUMP IN THE NORTHEAST CORNER OF THE BUILDING.**
- **SLOWLY OPEN BALL VALVE #12 TO PUT THE WATER SYSTEM TO THE OFFICE BUILDING AND TO THE TWO HOUSES BACK INTO OPERATION.**
- **RECORD THE SERVICE DATE IN THE ULTRA VIOLET STERILIZER MAINTENANCE LOG.**

REVERSE OSMOSIS SYSTEM:

PRE SEDIMENT AND CARBON FILTERS:

- **REPLACE THESE FILTERS MONTHLY OR SOONER IF REQUIRED. YOU CAN CONFIRM THAT THEY SHOULD BE REPLACED SOONER BY TESTING AS FOLLOWS:**
 - **THERE'S A PRESSURE GAUGE ON THE INLET SIDE OF THE SEDIMENT FILTER AND ON THE OUTLET SIDE OF THE CARBON FILTER ON THE WATER SUPPLY LINE TO THE REVERSE OSMOSIS SYSTEM.**
 - **TEST THE PRESSURE DIFFERENTIAL ACROSS THE 5-MICRON SEDIMENT FILTER AND THE CARBON FILTER BY OBSERVING THESE TWO PRESSURE GAUGES AT LEAST ONCE A WEEK. THIS MUST BE DONE WHEN THE REVERSE OSMOSIS SYSTEM IS OPERATING BECAUSE WATER "MUST" BE FLOWING THROUGH THE FILTERS TO DO THIS TEST.**
 - **CHANGE BOTH FILTERS IF THE PRESSURE DIFFERENTIAL IS 7 PSI OR MORE ACROSS THE TWO FILTERS.**
- **REPLACE THE FILTERS AS FOLLOWS:**
 - **UNPLUG THE POWER CORD ON THE REVERSE OSMOSIS SYSTEM.**
 - **CLOSE BALL VALVE #14.**
 - **PLACE A 20-LITER BUCKET ON THE FLOOR BELOW THE SEDIMENT AND CARBON FILTER SUMPS TO CATCH SPILLED WATER.**
 - **USE THE WHITE FILTER WRENCH (HANGING ON THE STAND BELOW THE FILTERS) TO LOOSEN THE FILTER SUMPS. PUT THE WRENCH ON THE FILTER WITH THE HANDLE POINTING TO THE RIGHT SIDE OF THE SUMPS AND PULL THE HANDLE TOWARDS YOURSELF. PULL FIRMLY; DON'T JERK ON THE HANDLE! WHILE PULLING ON THE HANDLE WITH YOUR RIGHT HAND, HOLD AGAINST THE SUMP WITH YOUR LEFT HAND TO STEADY THE FILTER ASSEMBLY.**
 - **AFTER THE SUMPS ARE LOOSENEED YOU CAN REMOVE THEM BY HAND WITHOUT THE USE OF THE WRENCH.**
 - **TIP THE SUMPS OVER POURING THE WATER AND THE OLD FILTERS INTO THE 20-LITER BUCKET.**
 - **RINSE THE SUMPS USING REVERSE OSMOSIS PRODUCT WATER FROM THE FIBERGLASS STORAGE TANK BY OPENING BALL VALVE #18 TO ADD WATER TO THE SUMPS. RINSE THE WATER AROUND IN THE SUMPS AND POUR THE RINSE WATER INTO THE 20-LITER BUCKET.**
 - **APPLY A "LIGHT" COATING OF SILICONE GREASE (SUPPLIED IN BROWN VIAL) ON THE SUMP O-RINGS.**
 - **TEAR THE PAPER WRAPPING OFF ONE END OF A NEW 5-MICRON SEDIMENT FILTER BEING CAREFUL NOT TO CONTAMINATE THE FILTER BY TOUCHING IT WITH YOUR HANDS.**
 - **INSERT THE 5 MICRON SEDIMENT FILTER INTO THE SUMP WHILE HOLDING THE OUTSIDE OF THE PAPER WRAPPING SO YOUR HAND DOES NOT TOUCH AND CONTAMINATE THE FILTER. REMOVE THE PAPER WRAPPING FROM THE FILTER.**
 - **TEAR THE PLASTIC WRAPPING OFF ONE END OF A NEW CARBON FILTER BEING CAREFUL NOT TO CONTAMINATE THE FILTER BY TOUCHING IT WITH YOUR HANDS.**
 - **INSERT THE CARBON FILTER INTO THE SUMP WHILE HOLDING THE OUTSIDE OF THE PLASTIC WRAPPING SO YOUR HAND DOES NOT TOUCH AND CONTAMINATE THE FILTER. REMOVE THE PLASTIC WRAPPING FROM THE FILTER.**
 - **INSTALL THE SUMPS BY HAND AND "JUST MAKE THEM SNUG". DO NOT USE A WRENCH TO TIGHTEN THE SUMPS OR IT WILL BE NEARLY IMPOSSIBLE TO REMOVE THEM THE NEXT TIME THE FILTERS HAVE TO BE CHANGED.**
 - **OPEN BALL VALVE #14 AND CHECK FOR LEAKS ON THE FILTERS.**
 - **PLUG IN THE REVERSE OSMOSIS SYSTEM POWER CORD.**
 - **RECORD THE DATE OF THE FILTER CHANGE IN THE RO MAINTENANCE LOG.**

POST CARBON FILTER:

- **THE ACTIVATED CARBON FILTER LOCATED BETWEEN BALL VALVE #18 AND BALL VALVE #19 REMOVES VOLATILE ORGANIC COMPOUNDS FROM THE WATER. WHEN THE REVERSE OSMOSIS PRODUCT WATER SHOWS THE FIRST SIGN OF OBJECTIONABLE TASTE THE CARBON FILTER IS NEARLY EXPENDED AND SHOULD BE REPLACED. IT SHOULD BE CHANGED AT LEAST ONCE A MONTH AS FOLLOWS:**
 - **CLOSE BALL VALVE #19.**
 - **PLACE A 20-LITER BUCKET UNDER THE BOTTLE FILL HOSE.**
 - **OPEN BALL VALVE #18 TO RELIEVE PRESSURE ON THE FILTER.**
 - **USE THE BLUE FILTER WRENCH (HANGING ON THE STAND BELOW THE FILTER) TO LOOSEN THE SUMP. PUT THE WRENCH ON THE FILTER WITH THE HANDLE POINTING TO THE RIGHT SIDE OF THE SUMP AND PULL THE HANDLE TOWARDS YOURSELF. PULL FIRMLY; DON'T JERK ON THE HANDLE! WHILE PULLING ON THE HANDLE WITH YOUR RIGHT HAND, HOLD AGAINST THE SUMP WITH YOUR LEFT HAND TO STEADY THE FILTER ASSEMBLY.**
 - **AFTER THE SUMP IS LOOSENED YOU CAN REMOVE IT BY HAND WITHOUT THE USE OF THE WRENCH.**
 - **TIP THE SUMP OVER POURING THE WATER AND THE OLD FILTER INTO THE 20-LITER BUCKET.**
 - **RINSE THE SUMP USING REVERSE OSMOSIS PRODUCT WATER FROM THE FIBERGLASS STORAGE TANK BY OPENING BALL VALVE #21 TO ADD WATER TO THE SUMP. RINSE THE WATER AROUND IN THE SUMP AND POUR THE RINSE WATER INTO THE 20-LITER BUCKET.**
 - **APPLY "LIGHT" COATING OF SILICONE GREASE (SUPPLIED IN BROWN VIAL) ON THE SUMP O-RING.**
 - **TEAR THE PLASTIC WRAPPING OFF ONE END OF A NEW CARBON FILTER BEING CAREFUL NOT TO CONTAMINATE THE FILTER BY TOUCHING IT WITH YOUR HANDS.**
 - **INSERT THE CARBON FILTER INTO THE SUMP WHILE HOLDING THE OUTSIDE OF THE PLASTIC WRAPPING SO YOUR HAND DOES NOT TOUCH AND CONTAMINATE THE FILTER. REMOVE THE PLASTIC WRAPPING FROM THE FILTER.**
 - **INSTALL THE SUMP BY HAND AND "JUST MAKE IT SNUG". DO NOT USE A WRENCH TO TIGHTEN THE SUMP OR IT WILL BE NEARLY IMPOSSIBLE TO REMOVE IT THE NEXT TIME THE FILTER HAS TO BE CHANGED.**
 - **CLOSE VALVE #18.**
 - **OPEN VALVE #19.**
 - **CHECK FOR LEAKS ON THE FILTER.**
 - **RECORD THE DATE OF THE FILTER CHANGE IN THE RO SYSTEM MAINTENANCE LOG.**

FLUSHING THE MEMBRANE:

- **ORGANIC OR MINERAL SLUDGE TENDS TO BUILD UP ON THE SURFACE OF THE MEMBRANE THAT CAN REDUCE ITS PERFORMANCE.**
- **THE MEMBRANE SHOULD BE FAST FLUSHED ONCE A WEEK.**
- **FLUSH THE MEMBRANE BY SLOWLY OPENING MANUAL FLUSH VALVE #22 WHICH IS LOCATED ON THE BACKSIDE OF THE REVESE OSMOSIS SYSTEM.**
- **LET THE UNIT FAST FLUSH FOR 5 MINUTES AND THEN SLOWLY CLOSE THE MANUAL FLUSH VALVE #22.**
- **RECORD THE DATE OF THE FAST FLUSH IN THE RO SYSTEM MAINTENANCE LOG.**

HUMIDIFIERS:

OFFICE BUILDING:

- **THIS HUMIDIFIER IS SUPPLIED WITH WATER FROM THE REVERSE OSMOSIS SYSTEM.**
- **THE WATER FROM THE REVERSE OSMOSIS SYSTEM CONTAINS VERY LOW AMOUNTS OF TOTAL DISSOLVED SOLIDS, SO THE WATER TRAY, DRUM AND FLOAT IN THIS HUMIDIFIER WILL PROBABLY HAVE TO BE CLEANED ONLY ONCE AT THE BEGINNING OF EVERY HEATING SEASON AS FOLLOWS:**
 - **CLOSE THE WATER SUPPLY VALVE; IT IS A PLASTIC BALL VALVE IN THE WATER LINE ADJACENT TO THE HUMIDIFIER.**
 - **REMOVE THE FRONT COVER FROM THE HUMIDIFIER.**
 - **REMOVE THE PIN IN THE VALVE TO REMOVE THE VALVE FLOAT ASSEMBLY.**
 - **REMOVE THE DRUM ASSEMBLY.**
 - **REMOVE THE PAD FROM THE DRUM ASSEMBLY.**
 - **REMOVE THE WATER PAN.**
 - **CLEAN BUILD-UP OF SOLIDS FROM THE VALVE FLOAT, DRUM ASSEMBLY AND WATER TRAY.**
 - **INSTALL NEW PAD ON THE DRUM ASSEMBLY (IF REQUIRED).**
 - **INSTALL THE DRAIN TRAY.**
 - **INSTALL THE DRUM ASSEMBLY.**
 - **INSTALL THE VALVE FLOAT ASSEMBLY.**
 - **OPEN THE WATER SUPPLY VALVE.**
 - **ALLOW THE WATER PAN TO FILL AND CONFIRM THAT IT SHUTS OFF THE WATER SUPPLY WHEN THE WATER PAN IS FULL.**
 - **INSTALL THE FRONT COVER ON THE HUMIDIFIER.**
- **THE PAD SHOULD BE CHECKED AT THE BEGINNING OF EVERY SEASON BECAUSE IT EVENTUALLY WILL DETERIORATE AND WILL SIMPLY FALL APART.**
- **THE DAMPER ON THE DUCT SHOULD BE OPENED AT THE BEGINNING OF THE HEATING SEASON AND SHOULD BE CLOSED AT THE END OF THE HEATING SYSTEM.**
- **THE BALL VALVE ON THE WATER SUPPLY LINE SHOULD BE OPENED AT THE BEGINNING OF THE HEATING SEASON AND CLOSED AT THE END OF THE HEATING SEASON.**
- **RECORD THE DATE OF THE SERVICE IN THE HUMIDIFIERS MAINTENANCE LOG.**

HOUSES:

- **THESE HUMIDIFIERS ARE BEING SUPPLIED WITH WATER FROM THE BUILDING WATER DISTRIBUTION SYSTEM. THIS WATER HAS A VERY HIGH CONCENTRATION OF TOTAL DISSOLVED SOLIDS (3000 PPM) WHICH WILL BUILD UP VERY QUICKLY IN THE WATER TRAYS, DRUMS AND FLOATS IN THESE UNITS.**
- **THESE HUMIDIFIERS SHOULD BE CLEANED AT LEAST ONCE A MONTH DURING THE HEATING SEASON AS FOLLOWS:**
 - **CLOSE THE SUPPLY VALVES (SADDLE VALVES ON THE COPPER WATER LINES).**
 - **REMOVE THE FRONT COVER FROM THE HUMIDIFIER.**
 - **REMOVE THE PIN IN THE VALVE TO REMOVE THE VALVE FLOAT ASSEMBLY.**
 - **REMOVE THE DRUM ASSEMBLY.**
 - **REMOVE THE PAD FROM THE DRUM ASSEMBLY.**
 - **REMOVE THE WATER PAN.**
 - **CLEAN BUILD-UP OF SOLIDS FROM THE VALVE FLOAT, DRUM ASSEMBLY AND WATER TRAY.**
 - **INSTALL NEW PAD ON THE DRUM ASSEMBLY.**
 - **INSTALL THE DRAIN TRAY.**

HOUSES (CONTINUED):

- **INSTALL THE DRUM ASSEMBLY.**
- **INSTALL THE VALVE FLOAT ASSEMBLY.**
- **OPEN THE WATER VALVE.**
- **ALLOW THE WATER PAN TO FILL AND CONFIRM THAT IT SHUTS OFF THE WATER SUPPLY WHEN THE WATER PAN IS FULL.**
- **INSTALL THE FRONT COVER ON THE HUMIDIFIER.**
- **THE DAMPER ON THE DUCT SHOULD BE OPENED AT THE BEGINNING OF THE HEATING SEASON AND SHOULD BE CLOSED AT THE END OF THE HEATING SEASON.**
- **THE BALL VALVE ON THE WATER SUPPLY LINE SHOULD BE OPENED AT THE BEGINNING OF THE HEATING SEASON AND CLOSED AT THE END OF THE HEATING SEASON.**
- **RECORD THE DATE OF THE SERVICE IN THE HUMIDIFIERS MAINTENANCE LOG.**

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PUBLIC NOTICE / AVIS PUBLIC

DO NOT DRINK – WATER IS NOT POTABLE

NE PAS BOIRE – EAU NON-POTABLE

DATE _____

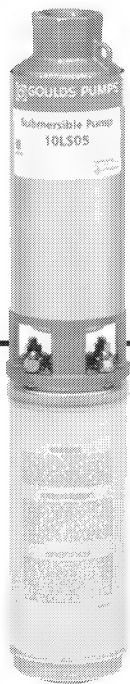
AUTHORIZATION (SIGN) _____

DANGER

**NON-POTABLE
WATER
DO NOT DRINK**

DANGER

**EAU NON
POTABLE
NE PAS BOIRE**



60 Hz STANDARD 4" Submersible Pumps

MODEL LS

5LS, 7LS, 10LS, 18LS, 25LS

SPECIFICATIONS

| Model | Flow Range US GPM | Horsepower Range | Best Eff. US GPM | Discharge Connection | Minimum Well Size | Rotation ^① |
|-------|----------------------|---------------------|---------------------|-------------------------|----------------------|-----------------------|
| 5LS | 1.2 – 7.5 | 1/4 – 1 1/4 | 5 | 1 1/4" | 4" | CCW |
| 7LS | 1.5 – 10 | 1/2 – 1 1/2 | 7 | 1 1/4" | 4" | CCW |
| 10LS | 3 – 16 | 3/4 – 1 1/2 | 10 | 1 1/4" | 4" | CCW |
| 18LS | 6 – 28 | 3/4 – 1 1/2 | 18 | 1 1/4" | 4" | CCW |
| 25LS | 8 – 33 | 1 – 1 1/2 | 25 | 1 1/4" | 4" | CCW |

① Rotation is counterclockwise when observed from pump discharge end.

FEATURES

- **Powered for Continuous Operation:** All ratings are within the working limits of the motor as recommended by the motor manufacturer. Pump can be operated continuously without damage to the motor.
- **Field Serviceable:** Pump can be rebuilt in the field to like new condition with common tools and readily available spare parts.
- NOTE:** The Model LS has left hand casing threads.
- **Sand Resistant Construction:** Field proven over almost four decades, face clearance design and floating impellers for an extremely abrasion resistant configuration.
- **Stainless Steel Metal Parts:** AISI stainless parts are corrosion resistant, non-toxic and non-leaching.
- **FDA Compliant Non-Metallic Parts:** Impellers, diffusers and upper bearing

- spider are constructed of a glass-filled engineered composite. This material is corrosion resistant and non-toxic.
- **Discharge Head:** High profile cast lead-free silicon bronze for superior strength and durability. Cast in loop for safety line.
- **Motor Adapter:** Cast lead-free silicon bronze is extremely rigid for accurate alignment of liquid end to motor. Generous space for removal of motor mounting nuts with regular open-end wrench.
- **Bowls:** Stainless steel for strength and abrasive resistance.
- **Check Valve:** Built-in check valve constructed of durable, abrasive resistant engineered composite. Positive sealing with Ethylene Propylene rubber o-ring.
- **Stainless Steel Casing:** Polished stainless steel is attractive and durable in the most corrosive water.

- **Hex Shaft Design:** Six sided shafts for positive impeller drive.
- **Shaft Coupling:** Exposed for ease of field alignment to motor shaft and to check pump rotation.
- **Urethane Upper Bearing:** Fluted design for free passage of abrasives and excellent resistance to sand damage.
- **Franklin Electric Motor:**
 - Corrosion resistant stainless steel construction through 10 HP.
 - Built-in surge arrestor is provided on single phase motors.
 - Stainless steel splined shaft.
 - Hermetically sealed windings.
 - Replaceable motor lead assembly.
 - UL 778 recognized.
 - NEMA mounting dimensions.
 - Control box is required with 3 wire single phase units.
 - Three phase units require a magnetic starter with three leg protection. Magnetic starter and heaters must be ordered separately.
 - Built-in auto-reset overload protection in single phase up to 1 1/2 HP – 2 wire and up to 1 HP – 3 wire.

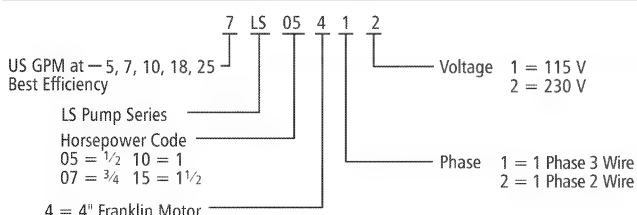
■ **Agency Listings:** All complete pump/motor assemblies are UL778 and CSA listed. All 4" Franklin Electric Motors are UL778 recognized.

"LS" SERIES MATERIALS OF CONSTRUCTION

| Part Name | Material |
|--|-----------------------------------|
| Discharge Head | Silicon Bronze |
| Check Valve Poppet | Ultrathane |
| Check Valve O-ring | Ethylene Propylene |
| Check Valve Retaining Spring | AISI 302 SS |
| Bearing Spider – Upper | Glass Filled Engineered Composite |
| Bearing | Urethane, FDA compliant |
| Klipring | AISI 301 SS |
| Diffuser | Glass Filled Engineered Composite |
| Impeller | Glass Filled Engineered Composite |
| Bowl | AISI 304 SS |
| Intermediate Sleeve ^② | AISI 304 SS, Powder Metal |
| Intermediate Shaft Coupling ^② | AISI 304 SS, Powder Metal |
| Intermediate Bearing Spider ^② | Glass Filled Engineered Composite |
| Intermediate Bearing Shim | AISI 303 SS |
| Spacer | AISI 304 SS, Powder Metal |
| Screws – Cable Guard | AISI 304 SS |
| Motor Adapter | Silicon Bronze |
| Suction Strainer | Engineered Composite |
| Casing | AISI 304 SS |
| Shaft | AISI 304 SS |
| Coupling | AISI 304 SS, Powder Metal |
| Cable Guard | AISI 304 SS |

② See Repair Parts page for where used.

ORDER NUMBER CODE



AGENCY LISTINGS

CSA Canadian Standards Association

UL Underwriters Laboratories

Goulds Pumps is ISO 9001 Registered.

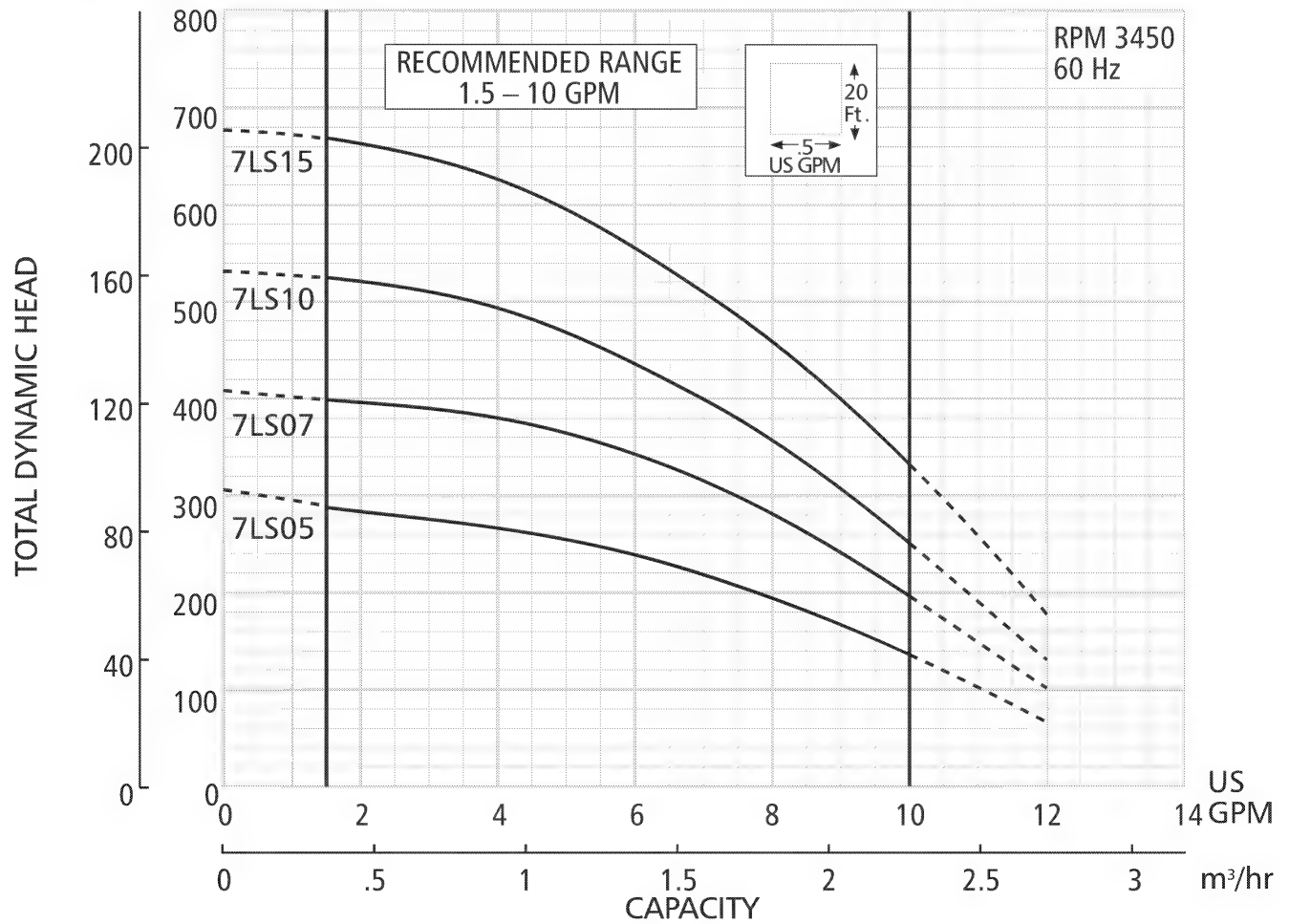
Goulds Pumps

ITT Industries

Model 7LS



METERS FEET

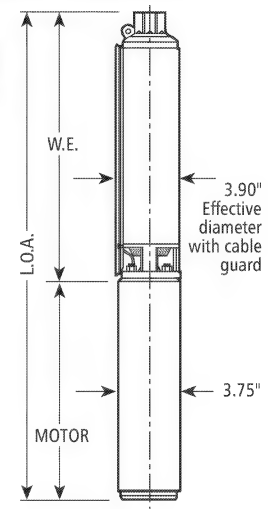


DIMENSIONS AND WEIGHTS

| Model | HP | Phase | Stages | Length (inches) | | | Weight (lbs.) | | |
|-------------------|----|-------|--------|-----------------|-------|---------|---------------|-------|-------|
| | | | | W.E.① | Motor | L.O.A.② | W.E. | Motor | Total |
| 7LS05412,22,11,21 | ½ | 1 | 10 | 13.3 | 9.5 | 22.8 | 7 | 19 | 26 |
| 7LS07412,22 | ¾ | 1 | 13 | 15.4 | 10.7 | 26.1 | 9 | 21 | 30 |
| 7LS10412,22 | 1 | 1 | 17 | 18.3 | 11.8 | 30.1 | 10 | 24 | 34 |
| 7LS15412 | 1½ | 1 | 22 | 21.9 | 13.6 | 35.5 | 12 | 28 | 40 |
| 7LS15422 | 1½ | 1 | 22 | 21.9 | 15.1 | 37.0 | 12 | 31 | 43 |

① W.E. = water end or pump without motor.

② L.O.A. = length of assembly – complete pump – water end and motor.



Model 7LS



SELECTION CHART

Horsepower Range $\frac{1}{2}$ – $1\frac{1}{2}$, Recommended Range 1.5 – 10 GPM, 60 Hz, 3450 RPM

| Pump Model | HP | PSI | Depth to Water in Feet/Ratings in US GPM (Gallons per Minute) | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|-----|---|------|-----|------|------|-----|-----|-----|-----|------|-----|-----|------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|--|
| | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 340 | 380 | 420 | 460 | 500 | 540 | 580 | 620 | |
| 7LS05 | ½ | 0 | | | | | | | 9.8 | 9.2 | 8.5 | 7.8 | 7.0 | 5.9 | 4.5 | 2.8 | | | | | | | | | | |
| | | 20 | | | | | 9.7 | 9.0 | 8.3 | 7.5 | 6.6 | 5.7 | 4.1 | 2.0 | | | | | | | | | | | | |
| | | 30 | | | | 9.5 | 8.9 | 8.2 | 7.3 | 6.4 | 5.4 | 4.0 | 1.5 | | | | | | | | | | | | | |
| | | 40 | | 10.0 | 9.4 | 8.8 | 8.1 | 7.3 | 6.1 | 5.1 | 3.9 | 1.5 | | | | | | | | | | | | | | |
| | | 50 | 10.0 | 9.3 | 8.6 | 8.0 | 7.1 | 6.0 | 4.8 | 3.3 | | | | | | | | | | | | | | | | |
| | | 60 | 9.2 | 8.5 | 7.8 | 7.0 | 5.9 | 4.5 | 2.8 | | | | | | | | | | | | | | | | | |
| Shut-off PSI | | | 121 | 113 | 104 | 95 | 87 | 78 | 69 | 61 | 52 | 43 | 35 | 26 | 17 | 9 | | | | | | | | | | |
| 7LS07 | ¾ | 0 | | | | | | | | | | 9.8 | 9.4 | 8.8 | 8.4 | 7.9 | 7.4 | 5.8 | 3.8 | | | | | | | |
| | | 20 | | | | | | | | 9.7 | 9.3 | 8.8 | 8.3 | 7.8 | 7.3 | 6.5 | 5.7 | 3.0 | | | | | | | | |
| | | 30 | | | | | | | 9.6 | 9.3 | 8.7 | 8.2 | 7.7 | 7.0 | 6.3 | 5.5 | 4.5 | | | | | | | | | |
| | | 40 | | | | | 10.1 | 9.5 | 9.1 | 8.7 | 8.2 | 7.7 | 6.9 | 6.2 | 5.4 | 4.5 | 2.7 | | | | | | | | | |
| | | 50 | | | | 10.0 | 9.4 | 9.0 | 8.5 | 8.0 | 7.6 | 6.8 | 6.0 | 5.2 | 4.0 | 2.5 | | | | | | | | | | |
| | | 60 | | | 9.8 | 9.4 | 8.8 | 8.4 | 7.9 | 7.4 | 6.7 | 5.8 | 5.0 | 3.8 | 1.5 | | | | | | | | | | | |
| Shut-off PSI | | | | | 148 | 140 | 131 | 123 | 114 | 105 | 97 | 88 | 79 | 71 | 62 | 53 | 45 | 27 | 10 | | | | | | | |
| 7LS10 | 1 | 0 | | | | | | | | | | | | | 9.7 | 9.4 | 9.1 | 8.2 | 7.4 | 6.5 | 5.2 | 3.5 | | | | |
| | | 20 | | | | | | | | | | | | 9.7 | 9.3 | 8.9 | 8.5 | 8.1 | 7.3 | 6.3 | 5.0 | 3.0 | | | | |
| | | 30 | | | | | | | | | | 10.0 | 9.6 | 9.2 | 8.8 | 8.4 | 8.1 | 7.7 | 6.7 | 5.6 | 4.0 | | | | | |
| | | 40 | | | | | | | | | 9.9 | 9.5 | 9.2 | 8.7 | 8.4 | 8.0 | 7.7 | 7.2 | 6.1 | 4.8 | 2.5 | | | | | |
| | | 50 | | | | | | | 9.8 | 9.4 | 9.1 | 8.7 | 8.3 | 7.8 | 7.5 | 7.1 | 6.2 | 5.4 | 3.9 | | | | | | | |
| | | 60 | | | | | | 9.7 | 9.4 | 9.1 | 8.6 | 8.2 | 7.8 | 7.4 | 7.0 | 6.5 | 5.8 | 4.4 | 2.0 | | | | | | | |
| Shut-off PSI | | | | | | | 177 | 168 | 159 | 151 | 142 | 133 | 125 | 116 | 107 | 99 | 81 | 64 | 47 | 29 | 12 | | | | | |
| 7LS15 | 1½ | 0 | | | | | | | | | | | | | | | 9.8 | 9.3 | 8.7 | 8.0 | 7.3 | 6.4 | 5.4 | 4.1 | 1.8 | |
| | | 20 | | | | | | | | | | | | | | | 10.1 | 9.8 | 9.2 | 8.5 | 7.9 | 7.2 | 6.4 | 5.3 | 3.8 | |
| | | 30 | | | | | | | | | | | | | | | | 9.8 | 9.5 | 8.8 | 8.2 | 7.4 | 6.7 | 5.7 | 4.5 | |
| | | 40 | | | | | | | | | | | | | 10.0 | 9.7 | 9.5 | 9.1 | 8.4 | 7.8 | 7.0 | 6.2 | 5.2 | 3.4 | | |
| | | 50 | | | | | | | | | | | | 9.9 | 9.6 | 9.4 | 9.0 | 8.7 | 8.0 | 7.4 | 6.5 | 5.6 | 4.2 | 2.3 | | |
| | | 60 | | | | | | | | | | | 9.8 | 9.6 | 9.3 | 9.0 | 8.7 | 8.3 | 7.6 | 6.9 | 6.0 | 4.9 | 3.1 | | | |
| Shut-off PSI | | | | | | | | | | | | 206 | 198 | 185 | 176 | 168 | 159 | 142 | 124 | 107 | 90 | 72 | 55 | 38 | 20 | |



Repair Parts

MODEL LS

5LS, 7LS, 10LS, 18LS, 25LS

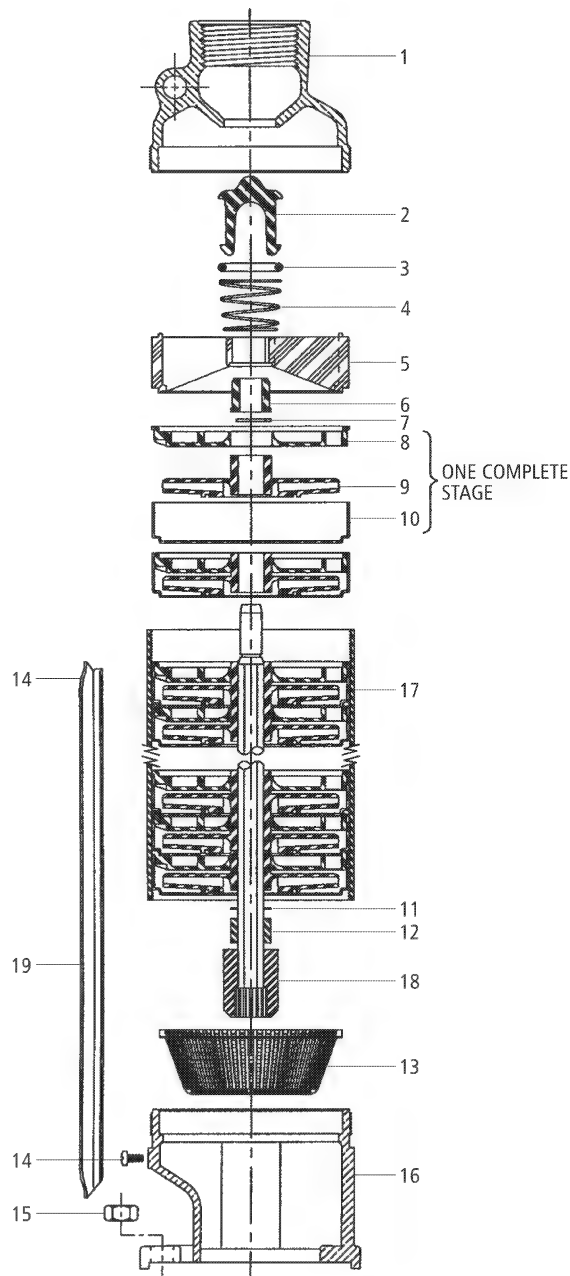
| Item No. | Description | Current Models ^② | | | | | | |
|----------|---|-----------------------------|-------------------------------|-----------------|--------|--------|--------|--------|
| | | HP | 5LS ^① (H97-G98) | 5LS (H98) | 7LS | 10LS | 18LS | 25LS |
| | Number of Stages | ½ | 12 | 12 | 10 | 7 | — | — |
| | | ¾ | 15 | 15 | 13 | 10 | 6 | — |
| | | 1 | 20 | 20 | 17 | 12 | 8 | 7 |
| | | 1½ | — | 26 ^③ | 22 | 17 | 11 | 9 |
| 1-4 | Discharge head/ check valve assembly | 7K1744 | | | | | | |
| 2 | Check valve poppet | 7K1559 | | | | | | |
| 3 | Check valve o-ring | 5K254 | | | | | | |
| 4 | Check valve spring | 7K1746 | | | | | | |
| 5 | Bearing spider | 7K1372 | | | | | | |
| 6 | Bearing | 7K1740 | | | | | | |
| 7 | Retaining ring | 7K817 | | | | | | |
| 8 | Diffuser | 7K1750 | 7K1750 | 7K995 | 7K17 | 7K20 | 7K20 | |
| 9 | Impeller | 7K1749 | 7K1837 | 7K1343 | 7K35 | 7K1334 | 7K1914 | |
| 10 | Bowl | 7K1751 | 7K1838 | 7K478 | 7K478 | 7K858 | 7K1886 | |
| 11 | Shim | 7K155 | | | | | | |
| 12 | Shaft sleeve | 7K1336 | | | | | | |
| 13 | Suction strainer | 7K1637 | | | | | | |
| 14 | Cable guard screws | 13K91 | | | | | | |
| 15 | Hex nut | 13K114 | | | | | | |
| 16 | Motor adapter | 7K1745 | | | | | | |
| 17 | Casings | ½ | 7K1430 | 7K1938 | 7K1936 | 7K1905 | — | — |
| | | ¾ | 7K1434 | 7K1941 | 7K1939 | 7K1935 | 7K1964 | — |
| | | 1 | 7K1507 | 7K1949 | 7K1973 | 7K1938 | 7K1935 | 7K1914 |
| | | 1½ | — | 7K1954 | 7K1951 | 7K1944 | 7K1939 | 7K1943 |
| 18 | Shaft and coupling (assemblies) | ½ | 7K1374 | 7K1377 | 7K1376 | 7K1360 | — | — |
| | | ¾ | 7K1377 | 7K1381 | 7K1380 | 7K1375 | 7K1359 | — |
| | | 1 | 7K1072 | 7K1458 | 7K1384 | 7K1377 | 7K1375 | 7K1374 |
| | | 1½ | — | 7K1839 | 7K1389 | 7K1457 | 7K1380 | 7K1378 |
| 19 | Cable guards | ½ | 7K1400 | 7K1888 | 7K1886 | 7K1883 | — | — |
| | | ¾ | 7K1404 | 7K1890 | 7K1889 | 7K1886 | 7K1883 | — |
| | | 1 | 7K1424 | 7K1917 | 7K1916 | 7K1888 | 7K1886 | 7K1886 |
| | | 1½ | 7K1922 | — | 7K1919 | 7K1916 | 7K1888 | 7K1888 |

① H97 — Began using large diameter hydraulic, previous models using small diameter hydraulic.

② Current models are identified by 4 cable guard screws.

③ Indicates model with one intermediate bearing spider 7K1371, one mid-bearing 7K1369 and one intermediate shaft sleeve 7K209.

Models 7LS15 and all 5LS models use (1) upthrust washer, part number 7K15, in the upper stage.



Goulds Pumps



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Effective February, 2002

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B5-25LS

Specifications are subject to change without notice.



4" Submersible Pumps

Installation and Operation Instructions

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Owner's Information

Pump Model #: _____
Pump Serial #: _____
Motor Model #: _____
Motor Serial #: _____
Dealer: _____
Dealer Telephone: _____
Purchase Date: _____
Installation Date: _____
Volts: _____
Amps: _____

Goulds Pumps

IM096R02

www.goulds.com



ITT Industries

SAFETY INSTRUCTIONS

TO AVOID SERIOUS OR FATAL PERSONAL INJURY OR MAJOR PROPERTY DAMAGE, READ AND FOLLOW ALL SAFETY INSTRUCTIONS IN MANUAL AND ON PUMP.

THIS MANUAL IS INTENDED TO ASSIST IN THE INSTALLATION AND OPERATION OF THIS UNIT AND MUST BE KEPT WITH THE PUMP.



This is a **SAFETY ALERT SYMBOL**. When you see this symbol on the pump or in the manual, look for one of the following signal words and be alert to the potential for personal injury or property damage.

⚠ DANGER Warns of hazards that **WILL** cause serious personal injury, death or major property damage.

⚠ WARNING Warns of hazards that **CAN** cause serious personal injury, death or major property damage.

⚠ CAUTION Warns of hazards that **CAN** cause personal injury or property damage.

NOTICE: INDICATES SPECIAL INSTRUCTIONS WHICH ARE VERY IMPORTANT AND MUST BE FOLLOWED.

THOROUGHLY REVIEW ALL INSTRUCTIONS AND WARNINGS PRIOR TO PERFORMING ANY WORK ON THIS PUMP.

MAINTAIN ALL SAFETY DECALS.

Important notice: Read safety instructions before proceeding with any wiring

⚠ WARNING All electrical work must be performed by a qualified technician. Always follow the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes. Code questions should be directed to your local electrical inspector. Failure to follow electrical codes and OSHA safety standards may result in personal injury or equipment damage. Failure to follow manufacturer's installation instructions may result in electrical shock, fire hazard, personal injury or death, damaged equipment, provide unsatisfactory performance, and may void manufacturer's warranty.

⚠ WARNING Standard units are not designed for use in swimming pools, open bodies of water, hazardous liquids, or where flammable gases exist. Well must be vented per local codes.

Only pumps specifically Listed for Class 1, Division 1 are allowable in hazardous liquids and where flammable gases may exist. *See specific pump catalog bulletins or pump nameplate for all agency Listings.*

⚠ WARNING Disconnect and lockout electrical power before installing or servicing any electrical equipment. Many pumps are equipped with automatic thermal overload protection which may allow an overheated pump to restart unexpectedly.

⚠ CAUTION

All three phase (3Ø) controls for submersible pumps must provide Class 10, quick-trip, overload protection.

⚠ WARNING

Do not lift, carry or hang pump by the electrical cables. Damage to the Electrical Cables can cause shock, burns or death.

⚠ WARNING

Use only stranded copper wire to pump/motor and ground. The ground wire must be at least as large as the power supply wires. Wires should be color coded for ease of maintenance and troubleshooting.

⚠ DANGER

Install wire and ground according to the National Electrical Code (NEC), or the Canadian Electrical Code, as well as all local, state and provincial codes.

⚠ WARNING

Install an all leg disconnect switch where required by code.

⚠ WARNING

The electrical supply voltage and phase must match all equipment requirements. Incorrect voltage or phase can cause fire, motor and control damage, and voids the warranty.

⚠ WARNING

All splices must be waterproof. If using splice kits follow manufacturer's instructions.

⚠ WARNING

Select the correct type and NEMA grade junction box for the application and location. The junction box must insure dry, safe wiring connections.

⚠ WARNING

Failure to permanently ground the pump, motor and controls before connecting to power can cause shock, burns or death.

⚠ WARNING

4" motors \geq 2 HP require a minimum flow rate of .25 ft/sec. or 7.62 cm/sec. past the motor for proper motor cooling. The following are the minimum flows in GPM per well diameter required for cooling: 1.2 GPM/4", 7 GPM/5", 13 GPM/6", 20 GPM/7", 30 GPM/8" or 50 GPM in a 10" well. Pumps \geq 2 HP installed in large tanks should be installed in a flow inducer sleeve to create the needed cooling flow or velocity past the motor.

⚠ CAUTION

This pump has been evaluated for use with Water Only.

INSTALLATION CHECK LIST

- Enter the pump and motor information and other requested data on the front of this manual.
- Inspect all components for shipping damage, report damage to the distributor immediately.
- Verify that motor HP and pump HP match.
- Match power supply voltage and phase to motor and control specifications.
- Select a dry, shaded location in which to mount the controls.
- Make all underwater and underground splices with waterproof splice connections.
- Hold the pump at the discharge head when installing threaded pipe or an adapter fitting as most pumps have left hand threads which will be loosened if you hold the pump anyplace except the discharge head.
- Check all plumbing connections to insure they are tight and sealed with Teflon tape.
- Verify that the pipe pressure rating is higher than pump shut-off pressure.
- Install a pressure relief valve on any system capable of creating over 75 PSI.
- Locate the pressure switch within 4' of the pressure tank to prevent switch chatter.
- Adjust tank pre-charge to 2 PSI below the system cut-in pressure setting, ex. 28 on a 30/50 system.
- Set the pump 10' above the well bottom to keep above sediment and debris.
- Insure that main power is disconnected, turned OFF, before wiring any components.
- Wiring should be performed only by qualified technicians.
- Wiring and Grounding must be in compliance with national and local codes.
- Restrict the flow with a ball or globe valve, 1/3 open, before starting pump for first time.
- Open a faucet or discharge valve on start-up to keep dirty water from entering the tank.
- Turn main breaker or disconnect ON.
- Run through several on/off cycles to verify proper switch operation.
- Check amps and enter the data on the front of this manual.
- Leave the manual with the owner or at the job site.

1.0 TYPICAL INSTALLATIONS

CAPTIVE AIR TANK INSTALLATION

NOTICE: TANK PRE-CHARGE PRESSURE CHANGES MUST BE MADE USING THE AIR VALVE ON TOP OF THE TANK.

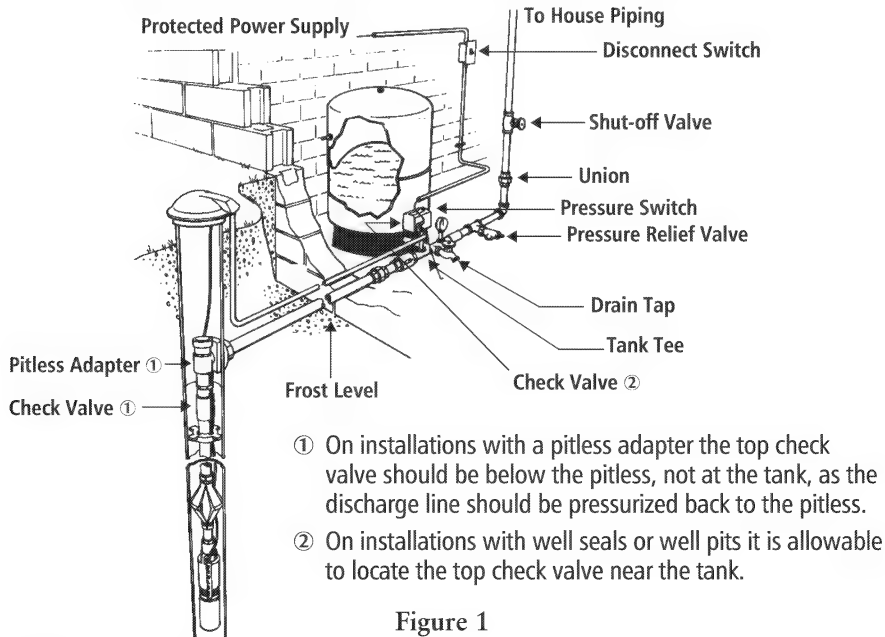
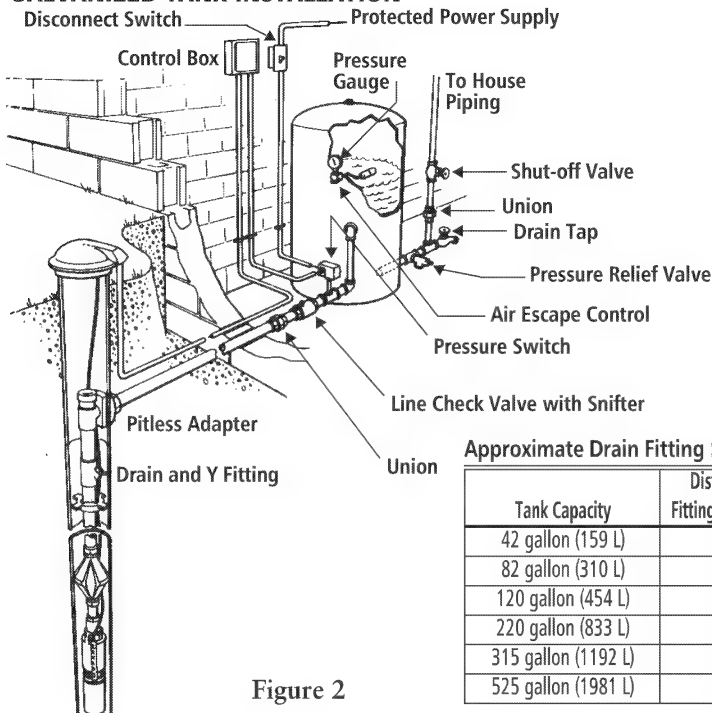


Figure 1

GALVANIZED TANK INSTALLATION



Approximate Drain Fitting Setting

| Tank Capacity | Distance Drain and "Y" Fitting Below the Line Check |
|---------------------|---|
| 42 gallon (159 L) | 7 feet (2.1m) |
| 82 gallon (310 L) | 10 feet (3m) |
| 120 gallon (454 L) | 15 feet (4.6m) |
| 220 gallon (833 L) | 15 feet (4.6m) |
| 315 gallon (1192 L) | 20 feet (6.1m) |
| 525 gallon (1981 L) | 20 feet (6.1m) |

Figure 2

2.0 PIPING

Notice: Most 4" submersibles have left-hand discharge head threads, hold the pump only at the "discharge head" when installing fittings or threaded pipe.



2.1 General

The pump discharge piping should be sized for efficient pump operation. Use the Friction Loss Tables to calculate total dynamic head using different pipe sizes. As a rule of thumb, use 1" for up to 10 gpm, 1¼" for up to 30 gpm, 1½" for up to 45 gpm, and 2" for up to 80 gpm. In the case of long pipe runs it is best to increase pipe size.

Some pumps are capable of very high discharge pressures, please select pipe accordingly. Consult with your pipe supplier to determine the best type of pipe for each installation.



2.2 Pressure Tank, Pressure Switch and Pressure Relief Valve

Select an area in which the ambient temperature is always above 34° F (1° C) in which to install the tank, pressure switch, and pressure relief valve. The tank should be located in an area where a leak will not damage property.

The pressure switch should be located at the tank cross tee and never more than 4' from the tank. Locating the switch more than 4' from the tank will cause switch chatter.

There should be no valves, filters, or high loss fittings between the switch and the tank(s) as switch

chatter may result. As an example, a 1¼" spring check valve has friction loss equal to 12' of pipe, placing the valve between the pressure switch and the pressure tank is the same as moving the pressure switch 12' away from the tank. It will create switch chatter.

On multiple tank installations the switch should be as close to the center of the tanks as possible. Multiple tank installations should have a manifold pipe at least 1½ times the size of the supply pipe from the pump. This will reduce the Friction Head in the manifold and reduce the possibility of switch chatter.

The cut-in setting on a 30 - 50 pressure switch is 30 psi. Cut-in is the lower of the pressure settings.

Pressure relief valves are required on any system that is capable of producing 100 psi or 230' TDH. If in an area where a water leak or blow-off may damage property connect a drain line to the pressure relief valve. Run it to a suitable drain or an area where the water will not damage property.

2.3 Adjusting Tank Pre-Charge

Insure that the tank is empty of water. Use a high quality pressure gauge to check the tank pre-charge pressure. The pressure should be 2 psi below the pump cut-in pressure. As an example, a 30-50 psi system would use a tank pre-charge of 28 psi.

2.4 Discharge Pipe

Note: Most discharge heads are threaded into the casing with left-hand threads. Hold the pump only at the discharge head when installing fittings. Failure to hold the discharge head will loosen it and pump damage will result on start-up.

If your pipe requires an adapter we strongly recommend using stainless steel. Galvanized fittings or pipe should never be connected directly to a stainless steel discharge head as galvanic corrosion may occur. Plastic or brass pumps can use any material for this connection. Barb type connectors should always be double clamped.

The pump discharge head has a loop for attaching a safety cable. The use of a safety cable is at the discretion of the installer.

2.5 Installing Pump in Well

If you are using a torque arrestor, install it per the manufacturer's installation instructions. Consult the seller for information on torque arrestors and for installation instructions.

Connect the discharge pipe to the discharge head or adapter you previously installed. Barb style connectors should always be double clamped. Install the pump into the well using a pitless adapter or similar device at the wellhead. Consult the fitting manufacturer or pitless supplier for specific installation instructions.

Using waterproof electrical tape, fasten the wires to the drop pipe at 10' intervals. Make sure that the tape does not loosen as it will block the pump suction if it falls down the well. Pump suppliers also sell clip-on style wire connectors that attach to the drop pipe.

2.6 Special Piping For Galvanized Tank Systems

When using a galvanized tank you should install an AV11 Drain & Y fitting in the well and an AV9 check valve with snifter valve at the tank. This will add air to the tank

on each pump start and prevent water logging the tank. Use an AA4 Air Escape on the tank to allow excess air to escape. The distance between the AV11 and AV9 determines the amount of air introduced on each cycle. See the table for recommended settings. *See Figure 2 in Sec 1.0.*

Gaseous wells should use galvanized tanks with AA4 air escapes to vent off excess air and prevent "spurting" at the faucets.

Methane and other explosive or dangerous gases require special water treatment for safe removal. Consult a water treatment specialist to address these issues.

Installations with top feeding wells should use flow sleeves on the pump.

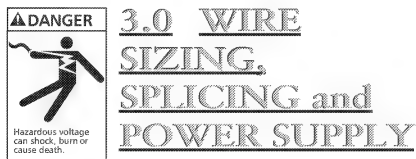
2.7 Check Valves

Our pumps use four different style check valves. We recommend check valves as they prevent back-spinning the pump and motor which will cause premature bearing wear. Check valves also prevent water hammer and upthrust damage. Check valves should be installed every 200' – 250' in the vertical discharge pipe.

The following information is for customers who wish to disable a check valve for a drain back system, these systems should use other means to prevent water hammer and upthrust damage:

- **Built-in stainless steel valves** have a flat which is easily drilled through using an electric drill and a 1/4" or 3/8" drill bit to disable the valve.
- **Poppet style check valves which are threaded in from the top** of the discharge head can be easily removed using a 1/2" nut driver or deep socket. The hex hub is visible and accessible from the top.

- **Internal Flomatic™ design plastic poppet style valves** must be removed from inside which requires pump disassembly.
- **Built-in plastic poppet style valves with a stem through the top** may be removed from discharge head by pulling on the stem with pliers.



Always follow the National Electric Code (N.E.C.), Canadian Electrical Code, and any state, provincial, or local codes.

We suggest using only copper wire. Size wire from the charts found in the Technical Data section of this manual, in the Franklin Electric AIM manual, or an N.E.C. (National Electric Code) code book. If discrepancies exist the N.E.C. book takes precedence over a manufacturer's recommendations.

3.1 Splicing Wire to Motor Leads

When the drop cable must be spliced or connected to the motor lead it is necessary that the splice be watertight. The splice can be done with heat shrink kits or waterproof tape.

A. Heat Shrink Splice Instructions

To use a typical heat shrink kit: strip $\frac{1}{2}$ " from the motor wires and drop cable wires, it is best to stagger the splices. Place the heat shrink tubes on the wires. Place the crimps on the wires and crimp the ends. Slide the heat shrink tubes over the crimps and heat from the center outward. The sealant and adhesive will ooze out the ends when the tube shrinks. The tube,

crimps, sealant, and adhesive create a very strong, watertight seal.

B. Taped Splice Instructions

- Strip individual conductor of insulation only as far as necessary to provide room for a stake type connector. Tubular connectors of the staked type are preferred. If connector O.D. is not as large as cable insulation, build-up with rubber electrical tape.
- Tape individual joints with rubber electrical tape, using two layers; the first extending two inches beyond each end of the conductor insulation end, the second layer two inches beyond the ends of the first layer. Wrap tightly, eliminating air spaces as much as possible.
- Tape over the rubber electrical tape with #33 Scotch electrical tape, or equivalent, using two layers as in step "B" and making each layer overlap the end of the preceding layer by at least two inches.

In the case of a cable with three conductors encased in a single outer sheath, tape individual conductors as described, staggering joints.

Total thickness of tape should be no less than the thickness of the conductor insulation.



4.1 Mounting the Motor Control Box

Single phase 3-wire control boxes meet U.L. requirements for Type 3R enclosures. They are suitable for vertical mounting in indoor and

outdoor locations. They will operate at temperatures between 14°F (-10°C) and 122°F (50°C). Select a shaded, dry place to mount the box. Insure that there is enough clearance for the cover to be removed.

4.2 Verify Voltage and Turn Supply Power Off

Insure that your motor voltage and power supply voltage are the same.

Place the circuit breaker or disconnect switch in the OFF position to prevent accidentally starting the pump before you are ready.

Three-phase starter coils are very voltage sensitive; always verify actual supply voltage with a voltmeter.

High or low voltage, greater than $\pm 10\%$, will damage motors and controls and is not covered under warranty.

4.3 Connecting Motor Leads to Motor Control Box, Pressure Switch or Starter



Caution Do not power the unit or run the pump until all electrical and plumbing connections are completed. Verify that the disconnect or breaker is

OFF before connecting the pressure switch line leads to the power supply. Follow all local and national codes. Use a disconnect where required by code.

A. Three-Wire Single Phase Motor

Connect the color coded motor leads to the motor control box terminals - Y (yellow), R (red), and B (black); and the Green or bare wire to the green ground screw.

Connect wires between the Load terminals on the pressure switch and control box terminals L1 and

L2. Run a ground wire between the switch ground and the control box ground. *See Figure 4 or 5.*

B. Two-Wire Single Phase Motor

Connect the black motor leads to the Load terminals on the pressure switch and the green or bare ground wire to the green ground screw. *See Figure 3.*

C. Three phase motors

Connect the motor leads to T1, T2, and T3 on the 3 phase starter. Connect the ground wire to the ground screw in the starter box. Follow starter manufacturers instructions for connecting pressure switch or *see Figure 6.*



4.4 Connect To Power Supply

Complete the wiring by making the connection from the single phase pressure switch Line

terminals to the circuit breaker panel or disconnect where used.

Three phase - make the connections between L1, L2, L3, and ground on the starter to the disconnect switch and then to the circuit breaker panel.

Three phase installations must be checked for motor rotation and phase unbalance. To reverse motor rotation, switch (reverse) any two leads. See the instructions for checking three phase unbalance in section 4.6. Failure to check phase unbalance can cause premature motor failure and nuisance overload tripping. If using a generator, see Technical Data for generators.

4.5 Three Phase Overload Protection

Use only Class 10, quick-trip overload protection on three-phase submersible motors. Furnas Class 14 NEMA starters with ESP100

overloads and Class 16 starters equipped with “K” overload heaters or ESP100 overloads will provide adequate protection.

The Franklin Electric Application Manual lists several acceptable starter/overload combinations. Call the FE hotline at 800-348-2420 or the pump manufacturer’s Customer Service group for selection assistance.

Note - If replacing an above ground motor with a submersible, verify that the overloads provide Class 10 protection, most above ground motors have Class 20 overloads. Use of Class 20 overloads on submersible motors will not protect the motors and voids the warranty.

4.6 Three Phase Power Unbalance

A full three phase supply consisting of three individual transformers or one three phase transformer is recommended. “Open” delta or wye connections using only two transformers can be used, but are more likely to cause poor performance, overload tripping or early motor failure due to current unbalance.

Check the current in each of the three motor leads and calculate the current unbalance as explained below.

If the current unbalance is 2% or less, leave the leads as connected.

If the current unbalance is more than 2%, current readings should be checked on each leg using each of the three possible hook-ups. Roll the motor leads across the starter in the same direction to prevent motor reversal.

To calculate percent of current unbalance:

- A. Add the three line amp values together.
- B. Divide the sum by three, yielding average current.
- C. Pick the amp value which is furthest from the average current (either high or low).
- D. Determine the difference between this amp value (furthest from average) and the average.
- E. Divide the difference by the average.
 Multiply the result by 100 to determine percent of unbalance.

| | Hookup 1 | | | Hookup 2 | | | Hookup 3 | | |
|-------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Starter Terminals | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 |
| | $\frac{\perp}{\text{T}}$ | $\frac{\perp}{\text{T}}$ | $\frac{\perp}{\text{T}}$ | $\frac{\perp}{\text{T}}$ | $\frac{\perp}{\text{T}}$ | $\frac{\perp}{\text{T}}$ | $\frac{\perp}{\text{T}}$ | $\frac{\perp}{\text{T}}$ | $\frac{\perp}{\text{T}}$ |
| Motor Leads | R | B | Y | Y | R | B | B | Y | R |
| | T3 | T1 | T2 | T2 | T3 | T1 | T1 | T2 | T3 |

Example:

| | | |
|--------------------|--------------------|--------------------|
| T3-R = 51 amps | T2-Y = 50 amps | T1-B = 50 amps |
| T1-B = 46 amps | T3-R = 48 amps | T2-Y = 49 amps |
| T2-Y = 53 amps | T1-B = 52 amps | T3-R = 51 amps |
| Total = 150 amps | Total = 150 amps | Total = 150 amps |
| ÷ 3 = 50 amps | ÷ 3 = 50 amps | ÷ 3 = 50 amps |
| — 46 = 4 amps | — 48 = 2 amps | — 49 = 1 amps |
| 4 ÷ 50 = .08 or 8% | 2 ÷ 50 = .04 or 4% | 1 ÷ 50 = .02 or 2% |

Current unbalance should not exceed 5% at service factor load or 10% at rated input load. If the unbalance cannot be corrected by rolling leads, the source of the unbalance must be located and corrected. If, on the three possible hookups, the leg farthest from the average stays on the same power lead, most of the unbalance is coming from the power source.

Contact your local power company to resolve the imbalance.

5.0 STARTING THE PUMP



5.1 Throttle the Discharge Before Starting Pump

Install a ball valve in the discharge line and set it $\frac{1}{3}$ open before operating the pump in an open discharge manner. This will protect the pump from upthrust damage and also prevent over pumping the well and reduce turbidity. Keep the valve partially closed until the water runs clear.



5.2 Throttling A High Static Level Well To Prevent Upthrust

Any well with a high static water level may allow the pump to operate off the curve to the right or outside the "Recommended Range" shown on the pump curve. We recommend using a "Dole" flow restrictor or throttling with a ball valve to prevent upthrust damage to the pump and motor. The maximum flow must be restricted to be within the pumps recommended operating range. If you use a ball valve, set it, remove the handle, tape the handle

to the pipe, and tag the valve with a note saying, "Do not open this valve or pump may be damaged". The easiest way to "set" the flow is to fill a 5 gallon bucket and time how long it takes to produce 5 gallons. Calculate the flow in gpm based on this value. As the water level drops in the well the flow will be reduced due to increased head and the valve will not interfere with performance.

5.3 Start the Pump

Partially open a valve (faucet) in the system and turn the breaker to the ON position.

Check all fittings for leaks.

Close the valve when the water clears and allow the pressure to build. If properly adjusted the switch should turn the pump off at the preset pressure. Open a few faucets and allow the pump to run through a few cycles. Check switch operation and verify that pressure settings are correct.

Recheck all fittings for leaks.

6.0 PAPERWORK and IOM

Please give this filled-in IOM and your business card to the owner. A sticker with your name and phone number on the tank or control box is a great sales tool for future business!

SINGLE PHASE – 60 HZ MOTOR SPECIFICATIONS

| Type | Goulds Motor #/ Control Box | Franklin Motor Model Prefix | HP | Volts | Hz | S.F. | Amps | S.F. Amps | Ohms M=Main S=Start | Inverse Time Breaker | Dual Ele. Time Del. Fuse |
|-------------------|-----------------------------------|-----------------------------------|----|-------|----|------|----------------------------|----------------------------|----------------------------------|----------------------------|--------------------------------|
| 4" 2W | S04932/ NR | 2445040 | ½ | 115 | 60 | 1.60 | 10.0 | 12.0 | 1.0 – 1.3 | 30 | 20 |
| | S04942/ NR | 2445050 | ½ | 230 | 60 | 1.60 | 5.0 | 6.0 | 4.2 – 5.2 | 15 | 10 |
| | S05942/ NR | 2445070 | ¾ | 230 | 60 | 1.50 | 6.8 | 8.0 | 3.0 – 3.6 | 20 | 15 |
| | S06942/ NR | 2445081 | 1 | 230 | 60 | 1.40 | 8.2 | 9.8 | 2.2 – 2.7 | 25 | 20 |
| | S07942/ NR | 2445091 | 1½ | 230 | 60 | 1.30 | 10.6 | 13.1 | 1.5 – 1.9 | 30 | 20 |
| 4" 3W | S04930/ 00043 | 2145044 | ½ | 115 | 60 | 1.60 | Y=10.0 B=10.0 R=0.0 | Y=12.0 B=12.0 R=0.0 | M = 1.0 – 1.3 S = 4.1 – 5.1 | 30 | 20 |
| | S04940/ 00044 | 2145054 | ½ | 230 | 60 | 1.60 | Y=5.0 B=5.0 R=0.0 | Y=6.0 B=6.0 R=0.0 | M = 4.2 – 5.2 S = 16.7 – 20.5 | 15 | 10 |
| | S05940/ 00054 | 2145074 | ¾ | 230 | 60 | 1.50 | Y=6.8 B=6.8 R=0.0 | Y=8.0 B=8.0 R=0.0 | M = 3.0 – 3.6 S = 11.0 – 13.4 | 20 | 15 |
| | S06940/ 00064 | 2145081 | 1 | 230 | 60 | 1.40 | Y=8.2 B=8.2 R=0.0 | Y=9.8 B=9.8 R=0.0 | M = 2.2 – 2.7 S = 10.1 – 12.3 | 25 | 20 |
| 4" 3W with RunCap | S07940/ 00074 | 2243001 | 1½ | 230 | 60 | 1.30 | Y=10.0 B=9.9 R=1.3 | Y=11.5 B=11.0 R=1.3 | M = 1.5 – 2.3 S = 6.2 – 12.0 | 30 | 20 |
| | S08940/ 00084 | 2243011 | 2 | 230 | 60 | 1.25 | Y=10.0 B=9.3 R=2.6 | Y=13.2 B=11.9 R=2.6 | M = 1.6 – 2.3 S = 5.2 – 7.15 | 25 | 20 |
| | S09940/ 00094 | 2243027 | 3 | 230 | 60 | 1.15 | Y=14.0 B=12.2 R=4.7 | Y=17.0 B=14.5 R=4.5 | M = 0.9 – 1.5 S = 3.0 – 4.9 | 40 | 30 |
| | S10940/ 00104 | 2243037 | 5 | 230 | 60 | 1.15 | Y=23.0 B=15.9 R=11.0 | Y=27.5 B=19.1 R=10.8 | M = 0.68 – 1.0 S = 1.8 – 2.8 | 60 | 45 |

M = Main Winding – Black to Yellow, S = Start Winding – Red to Yellow

Y = Yellow lead – line amps, B = Black lead – main winding amps,

R = Red lead, start or auxiliary winding amps

THREE PHASE – 60 HZ MOTOR SPECIFICATIONS

| Type | Goulds Model # | Franklin Motor Model Prefix | | | | | Rated Input | | Maximum (S.F. Load) | | Line to Line | Locked Rotor | KVA | Inverse Time Breaker | Dual Ele. Time Del. Fuse |
|-------------|----------------------|-----------------------------------|----|-------|----|------|-------------|-------|------------------------|-------|--------------|-----------------|------|----------------------------|--------------------------------|
| | | | HP | Volts | Hz | S.F. | Amps | Watts | Amps | Watts | Res. | Amps | Code | | |
| 4" 3450 RPM | S04978 | 234501 | ½ | 200 | 60 | 1.6 | 2.8 | 585 | 3.4 | 860 | 6.6-7.3 | 17.5 | N | 15 | 5 |
| | S04970 | 234511 | ½ | 230 | 60 | 1.6 | 2.4 | 585 | 2.9 | 860 | 9.5-10.4 | 15.0 | N | 15 | 5 |
| | S04975 | 234521 | ½ | 460 | 60 | 1.6 | 1.2 | 585 | 1.5 | 860 | 38.4-41.6 | 7.5 | N | 15 | 3 |
| | S05978 | 234502 | ¾ | 200 | 60 | 1.5 | 3.7 | 810 | 4.4 | 1150 | 4.66-5.12 | 24.6 | M | 15 | 8 |
| | S05970 | 234512 | ¾ | 230 | 60 | 1.5 | 3.2 | 810 | 3.8 | 1150 | 7.24-7.84 | 21.4 | M | 15 | 6 |
| | S05975 | 234522 | ¾ | 460 | 60 | 1.5 | 1.6 | 810 | 1.9 | 1150 | 27.8-30.2 | 10.7 | M | 15 | 3 |
| | S06978 | 234503 | 1 | 200 | 60 | 1.4 | 4.6 | 1070 | 5.4 | 1440 | 4.1-4.5 | 31.0 | M | 15 | 10 |
| | S06970 | 234513 | 1 | 230 | 60 | 1.4 | 4.0 | 1070 | 4.7 | 1440 | 5.2-5.6 | 27.0 | M | 15 | 8 |

THREE PHASE – 60 HZ MOTOR SPECIFICATIONS

| Type | Goulds Model # | Franklin Motor Model Prefix | | | | | Rated Input | | Maximum (S.F. Load) | | Line to Line | Locked Rotor | KVA | Inverse Time Breaker | Dual Ele. Time Del. Fuse |
|-------------|----------------|-----------------------------|----|-------|----|------|-------------|--------|---------------------|-------|--------------|--------------|------|----------------------|--------------------------|
| | | | HP | Volts | Hz | S.F. | Amps | Watts | Amps | Watts | Res. | Amps | Code | | |
| 4" 3450 RPM | S06975 | 234523 | 1 | 460 | 60 | 1.4 | 2.0 | 1070 | 2.4 | 1440 | 21.2-23.0 | 13.5 | M | 15 | 4 |
| | S07978 | 234504 | 1½ | 200 | 60 | 1.3 | 5.6 | 1460 | 6.8 | 1890 | 2.5-3.0 | 38.1 | K | 15 | 10 |
| | S07970 | 234514 | 1½ | 230 | 60 | 1.3 | 4.9 | 1460 | 5.9 | 1890 | 3.2-4.0 | 33.1 | K | 15 | 10 |
| | S07975 | 234524 | 1½ | 460 | 60 | 1.3 | 2.5 | 1460 | 3.0 | 1890 | 13.0-16.0 | 16.6 | K | 15 | 5 |
| | S07979 | 234534 | 1½ | 575 | 60 | 1.3 | 2.0 | 1460 | 2.4 | 1890 | 20.3-25.0 | 13.2 | K | 15 | 4 |
| | S08978 | 234305 | 2 | 200 | 60 | 1.25 | 7.9 | 2150 | 9.3 | 2700 | 1.9-2.4 | 53.6 | L | 20 | 15 |
| | S08970 | 234315 | 2 | 230 | 60 | 1.25 | 6.9 | 2150 | 8.1 | 2700 | 2.4-3.0 | 46.6 | L | 20 | 15 |
| | S08975 | 234325 | 2 | 460 | 60 | 1.25 | 3.5 | 2150 | 4.1 | 2700 | 9.7-12.0 | 23.3 | L | 15 | 8 |
| | S08979 | 234335 | 2 | 575 | 60 | 1.25 | 2.8 | 2150 | 3.2 | 2700 | 15.1-18.7 | 18.6 | L | 15 | 5 |
| | S09978 | 234306 | 3 | 200 | 60 | 1.15 | 11.3 | 2980 | 12.4 | 3420 | 1.3-1.7 | 71 | K | 30 | 20 |
| | S09970 | 234316 | 3 | 230 | 60 | 1.15 | 9.8 | 2980 | 10.8 | 3420 | 1.8-2.2 | 62 | K | 25 | 20 |
| | S09975 | 234326 | 3 | 460 | 60 | 1.15 | 4.9 | 2980 | 5.4 | 3420 | 7.0-8.7 | 31 | K | 15 | 10 |
| | S09979 | 234336 | 3 | 575 | 60 | 1.15 | 3.9 | 2980 | 4.3 | 3420 | 10.9-13.6 | 25 | K | 15 | 8 |
| | S10978 | 234307 | 5 | 200 | 60 | 1.15 | 18.4 | 5050 | 20.4 | 5810 | .70-.94 | 122 | K | 50 | 35 |
| | S10970 | 234317 | 5 | 230 | 60 | 1.15 | 16.0 | 5050 | 17.7 | 5810 | .93-1.2 | 106 | K | 40 | 30 |
| | S10975 | 234327 | 5 | 460 | 60 | 1.15 | 8.0 | 5050 | 8.9 | 5810 | 3.6-4.4 | 53 | K | 20 | 15 |
| | S10979 | 234337 | 5 | 575 | 60 | 1.15 | 6.4 | 5050 | 7.1 | 5810 | 5.6-6.9 | 43 | K | 20 | 15 |
| | S119784 | 234308 | 7½ | 200 | 60 | 1.15 | 27.1 | 7360 | 29.9 | 8450 | .46-.57 | 188 | K | 70 | 50 |
| | S119704 | 234318 | 7½ | 230 | 60 | 1.15 | 23.6 | 7360 | 26.0 | 8450 | .61-.75 | 164 | K | 60 | 45 |
| | S119754 | 234328 | 7½ | 460 | 60 | 1.15 | 11.8 | 7360 | 13.0 | 8450 | 2.4-3.4 | 82 | K | 30 | 25 |
| | S119794 | 234338 | 7½ | 575 | 60 | 1.15 | 9.4 | 7360 | 10.4 | 8450 | 3.5-5.1 | 66 | K | 25 | 20 |
| | S129724 | 234329 | 10 | 460 | 60 | 1.15 | 17.0 | 10,000 | 18.5 | 11400 | 1.8-2.3 | 116 | L | 45 | 30 |
| | S119794 | 234339 | 10 | 575 | 60 | 1.15 | 13.6 | 10,000 | 14.8 | 11400 | 2.8-3.5 | 92.8 | L | 35 | 25 |

NOTES: Model numbers are three lead motors. Six lead motors with different model numbers have the same running performance, but when wye connected for starting have locked rotor amps 33% of the values shown. **For additional motor data call Franklin Electric at 1-800-348-2420.**

FURNAS STARTERS AND HEATERS

| Motor Size | HP | Volts | FURNAS Class 16 | | ESP100 | Inverse Time Breaker | Dual Ele. Time Del. Fuse |
|------------|----|-------|-----------------|---------|--------|----------------------|--------------------------|
| | | | Order Number | Heaters | | | |
| 4" 3Ø | ½ | 200 | 16AD | K29 | CSBD | 15 | 5 |
| | | 230 | 16AG | K28 | CSBA | 15 | 5 |
| | | 460 | 16AH | K21 | CSBC | 15 | 5 |
| | ¾ | 200 | 16AD | K33 | CSBD | 15 | 8 |
| | | 230 | 16AG | K31 | CSBA | 15 | 6 |
| | | 460 | 16AH | K22 | CSBC | 15 | 3 |
| | 1 | 200 | 16AD | K37 | CSDD | 15 | 10 |
| | | 230 | 16AG | K34 | CSDA | 15 | 8 |
| | | 460 | 16AH | K26 | CSBC | 15 | 4 |
| | 1½ | 200 | 16AD | K41 | CSDD | 15 | 10 |
| | | 230 | 16AG | K37 | CSDA | 15 | 10 |
| | | 460 | 16AH | K28 | CSDC | 15 | 5 |
| | 2 | 575 | 16AE | K26 | CSBE | 15 | 4 |
| | | 200 | 16AD | K49 | CSDD | 20 | 15 |
| | | 230 | 16AG | K43 | CSDA | 20 | 15 |
| 4" 3Ø | 2 | 460 | 16AH | K32 | CSDC | 15 | 8 |
| | | 575 | 16AE | K29 | CSDE | 15 | 5 |
| | 3 | 200 | 16AD | K54 | CSED | 30 | 20 |
| | | 230 | 16AG | K52 | CSEA | 25 | 20 |
| | | 460 | 16AH | K37 | CSDC | 15 | 10 |
| | 5 | 575 | 16AE | K33 | CSDE | 15 | 8 |
| | | 200 | 16AD | K61 | DSFD | 50 | 35 |
| | | 230 | 16AG | K60 | DSFA | 40 | 30 |
| | 7½ | 460 | 16AH | K49 | CSDC | 20 | 15 |
| | | 575 | 16AE | K41 | CSDE | 20 | 15 |
| | | 200 | 16CD | K69 | DSFD | 70 | 50 |
| | 10 | 230 | 16BG | K64 | DSFA | 60 | 45 |
| | | 460 | 16AH | K54 | DSEC | 30 | 25 |
| | | 575 | 16AE | K52 | DSEE | 25 | 20 |
| | | 460 | 16AH | K60 | DSEC | 45 | 30 |
| | | 575 | 16AE | K57 | DSEE | 35 | 25 |

NOTE: The Class 16 starter chart shows the order number for matched coil and load voltage, i.e. a 230 volt power supply with a 230 volt coil. To use a different coil voltage select the same size starter with a different coil.

Nomenclature: Ex. 16 B H;

16 = Class 16 DP Starter

B = Starter size, sizes are A, B, C, D, E, F, G, H. Size determined by Full Load Amps and Locked Rotor Amps.

H = coil voltage. Voltages are: D = 200 V, E = 575 V, F = 115 V, G = 230 V, H = 460 V.

The Class 14 starter nomenclature can be found in your Jet & Submersible Price Book.

Technical Data

MOTOR INSULATION RESISTANCE READINGS

Normal Ohm/Megohm readings, ALL motors, between all leads and ground

CAUTION To perform insulation resistance test, open breaker and disconnect all leads from QD control box or pressure switch. Connect one ohmmeter lead to any motor lead and one to metal drop pipe or a good ground. **R x 100K Scale**

| Condition of Motor and Leads | OHM Value | Megohm Value |
|--|----------------------|--------------|
| New motor, without power cable | 20,000,000 (or more) | 20.0 |
| Used motor, which can be reinstalled in well | 10,000,000 (or more) | 10.0 |
| Motor in well – Readings are power cable plus motor | | |
| New motor | 2,000,000 (or more) | 2.0 |
| Motor in reasonably good condition | 500,000 to 2,000,000 | 0.5 – 2.0 |
| Motor which may be damaged or have damaged power cable <i>Do not pull motor for these reasons</i> | 20,000 to 500,000 | 0.02 – 0.5 |
| Motor definitely damaged or with damaged power cable <i>Pull motor and repair</i> | 10,000 to 20,000 | 0.01 – 0.02 |
| Failed motor or power cable <i>Pull motor and repair</i> | Less than 10,000 | 0 – 0.01 |

Generator Operation

- For externally regulated generator kilovolt amperes (KVA) ratings see Table 1. Electrical voltage, frequency, phase and ampacity, **MUST** match that shown on the motor nameplate, or pump control box.



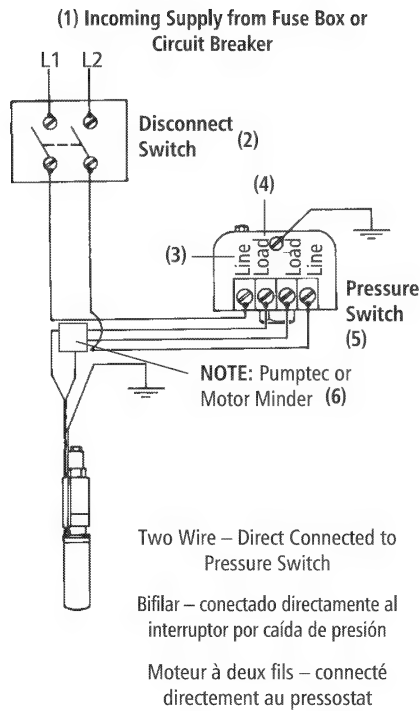
FAILURE TO USE A MANUAL OR AUTOMATIC TRANSFER SWITCH WHEN GENERATOR IS USED AS STANDBY OR BACKUP CAN CAUSE SHOCK, BURNS OR DEATH.

| Min. Generator Rating | Pump Motor Horsepower ① | | | | | | | |
|-----------------------|-------------------------|-----|-----|-----|-------|-----|------|------|
| | 1/3 | 1/2 | 3/4 | 1 | 1 1/2 | 2 | 3 | 5 |
| KVA | 1.9 | 2.5 | 3.8 | 5.0 | 6.3 | 9.4 | 12.5 | 18.8 |
| KW | 1.5 | 2.0 | 3.0 | 4.0 | 5.0 | 7.5 | 10.0 | 15.0 |

① **NOTE:** For two-wire motors, minimum generator ratings 50% higher than shown are necessary.

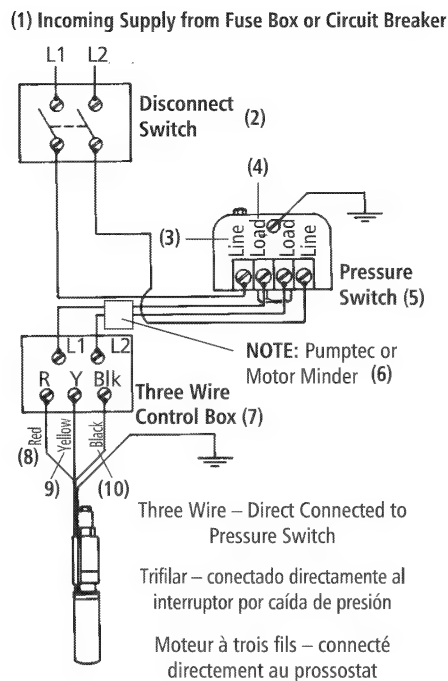
NOTICE: FOLLOW THE GENERATOR MANUFACTURER'S INSTRUCTIONS CAREFULLY.

Courtesy of Franklin Electric Company



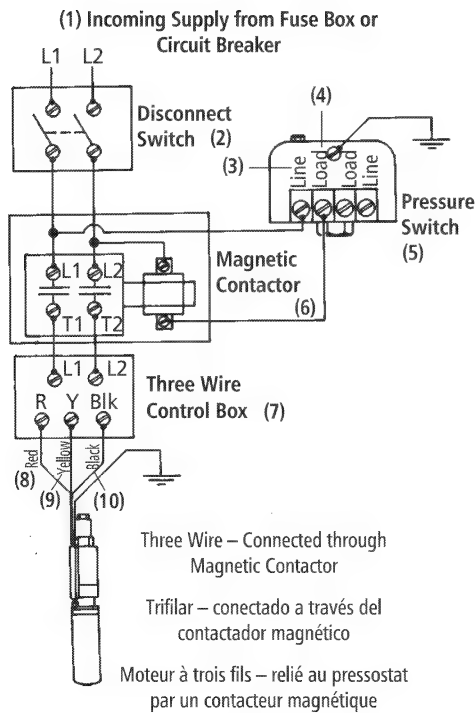
1. Suministro de entrada de la caja de fusibles o del cortacircuitos
2. Interruptor de desconexión
3. Línea
4. Carga
5. Interruptor por caída de presión
6. NOTA: Pumptec o Motor Minder
7. Caja de control trifilar
8. Rojo
9. Amarillo
10. Negro

Figure (Figura) 3



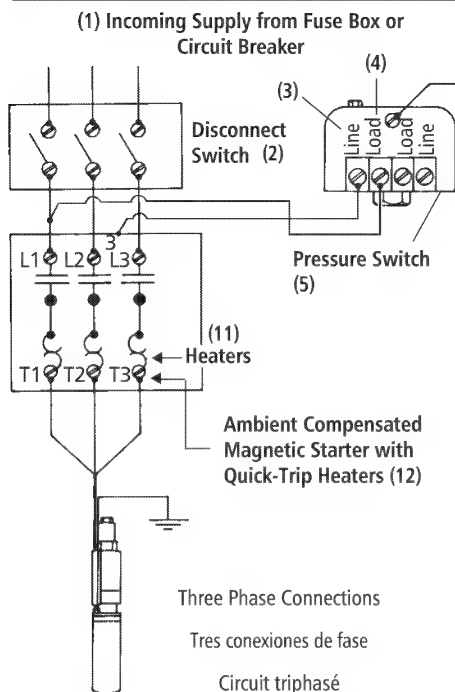
1. Courant d'entrée provenant de la boîte à fusibles ou du disjoncteur
2. Sectionneur
3. Ligne
4. Charge
5. Pressostat
6. Protection Pumptec ou Motor Minder
7. Boîte de commande à trois fils
8. Rouge
9. Jaune
10. Noir

Figure (Figura) 4



1. Suministro de entrada de la caja de fusibles o del cortacircuitos
2. Interruptor de desconexión
3. Línea
4. Carga
5. Interruptor por caída de presión
6. Contactador magnético
7. Caja de control trifilar
8. Rojo
9. Amarillo
10. Negro
11. Calentadores
12. Arrancador magnético con compensación ambiental con calentadores de disparo rápido

Figure (Figura) 5

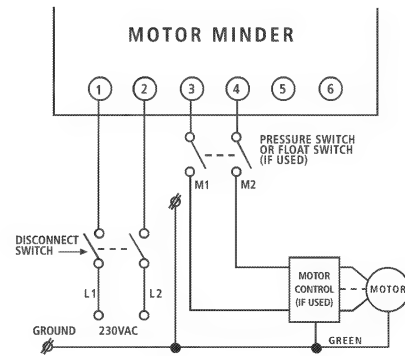
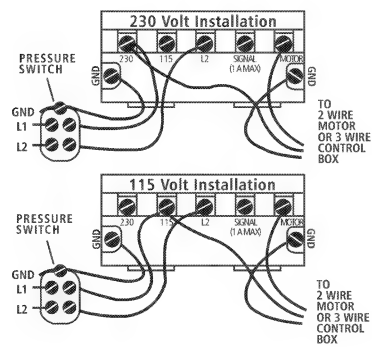


1. Courant d'entrée provenant de la boîte à fusibles ou du disjoncteur
2. Sectionneur
3. Ligne
4. Charge
5. Pressostat
6. Contacteur magnétique
7. Boîte de commande à trois fils
8. Rouge
9. Jaune
10. Noir
11. Dispositifs de protection contre la surcharge (DPS)
12. Démarreur magnétique compensé (température ambiante) avec DPS à déclenchement rapide

Figure (Figura) 6

PUMPTEC WIRING

MOTOR MINDER WIRING



SINGLE PHASE MOTOR MAXIMUM CABLE LENGTH (motor to service entrance) (2)

| Motor Rating | | Copper Wire Size (1) | | | | | | | | |
|--------------|-----|----------------------|-----|------|------|------|------|------|-------|------|
| Volts | HP | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 0 | 00 |
| 115 | 1/3 | 130 | 210 | 340 | 540 | 840 | 1300 | 1960 | 2910 | 3540 |
| | 1/2 | 100 | 160 | 250 | 390 | 620 | 960 | 1460 | 2160 | 2630 |
| 230 | 1/3 | 550 | 880 | 1390 | 2190 | 3400 | 5250 | 7960 | 11770 | |
| | 1/2 | 400 | 650 | 1020 | 1610 | 2510 | 3880 | 5880 | 8720 | |
| | 3/4 | 300 | 480 | 760 | 1200 | 1870 | 2890 | 4370 | 6470 | 7870 |
| | 1 | 250 | 400 | 630 | 990 | 1540 | 2380 | 3610 | 5360 | 6520 |
| | 1.5 | 190 | 310 | 480 | 770 | 1200 | 1870 | 2850 | 4280 | 5240 |
| | 2 | 150 | 250 | 390 | 620 | 970 | 1530 | 2360 | 3620 | 4480 |
| | 3 | 120* | 190 | 300 | 470 | 750 | 1190 | 1850 | 2890 | 3610 |
| | 5 | 0 | 0 | 180* | 280 | 450 | 710 | 1110 | 1740 | 2170 |
| | 7.5 | 0 | 0 | 0 | 200* | 310 | 490 | 750 | 1140 | 1410 |
| | 10 | 0 | 0 | 0 | 0 | 250* | 390 | 600 | 930 | 1160 |
| | 15 | 0 | 0 | 0 | 0 | 170* | 270* | 430 | 660 | 820 |

- (1) This table is based on copper wire. If aluminum wire is used it must be two sizes larger.
Example: When the table calls for #12 copper wire you would use #10 aluminum wire.
- (2) Single phase control boxes may be connected at any point of the total cable length.

THREE PHASE MOTOR MAXIMUM CABLE LENGTH (motor to service entrance) (3)

| Motor Rating | | Copper Wire Size (1) | | | | | | | | | | |
|----------------|-----|----------------------|------|------|------|------|------|------|------|------|------|------|
| Volts | HP | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 0 | 00 | 000 | 0000 |
| 200 V 60 Hz | .5 | 710 | 1140 | 1800 | 2840 | 4420 | | | | | | |
| | .75 | 510 | 810 | 1280 | 2030 | 3160 | | | | | | |
| | 1 | 430 | 690 | 1080 | 1710 | 2670 | 4140 | | | | | |
| | 1.5 | 310 | 500 | 790 | 1260 | 1960 | 3050 | | | | | |
| | 2 | 240 | 390 | 610 | 970 | 1520 | 2360 | 3610 | 5420 | | | |
| | 3 | 180 | 290 | 470 | 740 | 1160 | 1810 | 2760 | 4130 | | | |
| | 5 | 110* | 170 | 280 | 440 | 690 | 1080 | 1660 | 2490 | 3050 | 3670 | 4440 |
| | 7.5 | 0 | 0 | 200 | 310 | 490 | 770 | 1180 | 1770 | 2170 | 2600 | 3150 |
| 230 V 60 Hz | 10 | 0 | 0 | 0 | 230* | 370 | 570 | 880 | 1330 | 1640 | 1970 | 2390 |
| | .5 | 930 | 1490 | 2350 | 3700 | 5760 | 8910 | | | | | |
| | .75 | 670 | 1080 | 1700 | 2580 | 4190 | 6490 | 9860 | | | | |
| | 1 | 560 | 910 | 1430 | 2260 | 3520 | 5460 | 8290 | | | | |
| | 1.5 | 420 | 670 | 1060 | 1670 | 2610 | 4050 | 6160 | 9170 | | | |
| | 2 | 320 | 510 | 810 | 1280 | 2010 | 3130 | 4770 | 7170 | 8780 | | |
| | 3 | 240 | 390 | 620 | 990 | 1540 | 2400 | 3660 | 5470 | 6690 | 8020 | 9680 |
| | 5 | 140* | 230 | 370 | 590 | 920 | 1430 | 2190 | 3290 | 4030 | 4850 | 5870 |
| 460 V 60 Hz | 7.5 | 0 | 160* | 260 | 420 | 650 | 1020 | 1560 | 2340 | 2870 | 3440 | 4160 |
| | 10 | 0 | 0 | 190* | 310 | 490 | 760 | 1170 | 1760 | 2160 | 2610 | 3160 |
| | .5 | 3770 | 6020 | 9460 | | | | | | | | |
| | .75 | 2730 | 4350 | 6850 | | | | | | | | |
| | 1 | 2300 | 3670 | 5770 | 9070 | | | | | | | |
| | 1.5 | 1700 | 2710 | 4270 | 6730 | | | | | | | |
| | 2 | 1300 | 2070 | 3270 | 5150 | 8050 | | | | | | |
| | 3 | 1000 | 1600 | 2520 | 3970 | 6200 | | | | | | |
| 575 V 60 Hz | 5 | 590 | 950 | 1500 | 2360 | 3700 | 5750 | | | | | |
| | 7.5 | 420 | 680 | 1070 | 1690 | 2640 | 4100 | 6260 | | | | |
| | 10 | 310 | 500 | 790 | 1250 | 1960 | 3050 | 4680 | 7050 | | | |
| | .5 | 5900 | 9410 | | | | | | | | | |
| | .75 | 4270 | 6810 | | | | | | | | | |
| | 1 | 3630 | 5800 | 9120 | | | | | | | | |
| | 1.5 | 2620 | 4180 | 6580 | | | | | | | | |
| | 2 | 2030 | 3250 | 5110 | 8060 | | | | | | | |
| | 3 | 1580 | 2530 | 3980 | 6270 | | | | | | | |
| | 5 | 920 | 1480 | 2330 | 3680 | 5750 | | | | | | |
| | 7.5 | 660 | 1060 | 1680 | 2650 | 4150 | | | | | | |
| | 10 | 490 | 780 | 1240 | 1950 | 3060 | 4770 | | | | | |

(3) The portion of the total cable which is between the service entrance and a three phase motor starter should not exceed 25% of the total maximum length to assure reliable starter operation.

Lengths marked * meet the U.S. National Electrical Code ampacity only for individual conductor 75°C cable. Only the lengths without * meet the code for jacketed 75°C cable. Local code requirements may vary.

For additional cable information, go to www.franklin-electric.com or call Franklin Electric at 1-800-348-2420.

Troubleshooting



DISCONNECT AND LOCKOUT ELECTRICAL POWER BEFORE ATTEMPTING ANY SERVICE. FAILURE TO DO SO CAN CAUSE SHOCK, BURNS OR DEATH.

| Symptom | Probable Cause | Recommended Action |
|--|--|---|
| PUMP MOTOR NOT RUNNING | 1. Motor thermal protector tripped a. Incorrect control box b. Incorrect or faulty electrical connections c. Faulty thermal protector d. Low voltage e. Ambient temperature of control box/starter too high f. Pump bound by foreign matter g. Inadequate submergence | 1. Allow motor to cool, thermal protector will automatically reset a – e. Have a qualified electrician inspect and repair, as required f. Pull pump, clean, adjust set depth as required g. Confirm adequate unit submergence in pumpage |
| | 2. Open circuit breaker or blown fuse | 2. Have a qualified electrician inspect and repair, as required |
| | 3. Power source inadequate for load | 3. Check supply or generator capacity |
| | 4. Power cable insulation damage | 4 – 5. Have a qualified electrician inspect and repair, as required |
| | 5. Faulty power cable splice | |
| LITTLE OR NO LIQUID DELIVERED BY PUMP | 1. Faulty or incorrectly installed check valve | 1. Inspect check valve, repair as required |
| | 2. Pump air bound | 2. Successively start and stop pump until flow is delivered |
| | 3. Lift too high for pump | 3. Review unit performance, check with dealer |
| | 4. Pump bound by foreign matter | 4. Pull pump, clean, adjust set depth as required |
| | 5. Pump not fully submerged | 5. Check well recovery, lower pump if possible |
| | 6. Well contains excessive amounts of air or gases | 6. If successive starts and stops does not remedy, well contains excessive air or gases |
| | 7. Excessive pump wear | 7. Pull pump and repair as required |
| | 8. Incorrect motor rotation – three phase only. | 8. Reverse any two motor electrical leads |

4" Submersible Motors Super Stainless



Applications

These motors are built for dependable operation in 4" diameter or larger water wells.

Basic Features

- Corrosion-resistant stainless steel exterior
- Stainless steel splined shaft
- Hermetically-sealed windings
- StatorShield™ resin system
- Filter check valve
- Water lubrication
- Kingsbury-type thrust bearing
- Pressure-equalizing diaphragm
- Built-in lightning arrestors (All single-phase; 200 & 300 V three-phase)
- Removable water bloc lead
- Franklin-manufactured control boxes available for single-phase motors
- UL 778 recognized (North American voltages)
- CSA certified
- ANSI/NSF 61 certified
- Industry standard NEMA mounting dimensions

Special Features

- Flow inducer sleeve not required in water up to 86 °F (30 °C) for motors through 2 hp.
- Two-wire motors are split-phase designs with integral starting components and do not require a control box. They feature Franklin's patented 2-wire BIAC starting switch which provides Reverse Impact Torque to aid starting in adverse environments and prevents extreme fast cycling (e.g. water logged tank).
- Three-wire motors through 1 hp use Franklin's exclusive three-wire QD (Quick Disconnect) Control Box with the patented QD Relay. This relay provides the ultimate in operational life.
- Single-phase motors can be used with Pumptec products to protect against dry-run and other installation conditions that can damage motors and/or pumps. See Single-phase Protection Devices for details.

Constant Pressure Options

- Use Franklin's MonoDrive controller with 1½ hp three-wire single-phase motors to provide constant water pressure.
- Three-phase motors can be used with SubDrive controllers to provide constant water pressure.

Pollution Recovery Option

- Pollution Recovery motors are equipped for use in monitoring and recovery wells in which hydrocarbons and other chemicals may be present.
- Special Viton® rubber parts and other chemical resistant materials as listed in Construction Materials chart.

4" Submersible Motors Super Stainless

4-Inch Super Stainless Motor Specifications

| Hz | Ph | Hp Range | kW Range | Poles | RPM | Max. Ambient Temp. | Duty Rating |
|----|-------------|-----------|------------|-------|------|--------------------|-------------|
| 60 | 2-Wire | 0.3 - 1.5 | 0.25 - 1.1 | 2 | 3450 | 86 °F / 30 °C | Continuous |
| 50 | 2-Wire | 0.5 - 1.5 | 0.37 - 1.1 | 2 | 2875 | 86 °F / 30 °C | Continuous |
| 60 | 3-Wire | 0.3 - 3 | 0.25 - 2.2 | 2 | 3450 | 86 °F / 30 °C | Continuous* |
| 50 | 3-Wire | 0.3 - 3 | 0.25 - 2.2 | 2 | 2875 | 86 °F / 30 °C | Continuous* |
| 60 | Three-Phase | 0.5 - 3 | 0.37 - 2.2 | 2 | 3450 | 86 °F / 30 °C | Continuous* |
| 50 | Three-Phase | 0.5 - 3 | 0.37 - 2.2 | 2 | 2875 | 86 °F / 30 °C | Continuous* |

4-Inch Pollution Recovery Motor Specifications

| Hz | Ph | Hp Range | kW Range | Poles | RPM | Max. Ambient Temp. | Duty Rating |
|----|-------------|-----------|------------|-------|------|--------------------|-------------|
| 60 | 2-Wire | 0.3 - 1.5 | 0.25 - 1.1 | 2 | 3450 | 86 °F / 30 °C | Continuous |
| 50 | 2-Wire | 0.5 - 1.5 | 0.37 - 1.1 | 2 | 2875 | 86 °F / 30 °C | Continuous |
| 60 | 3-Wire | 0.3 - 2 | 0.25 - 1.5 | 2 | 3450 | 86 °F / 30 °C | Continuous* |
| 50 | 3-Wire | 0.3 - 2 | 0.25 - 1.5 | 2 | 2875 | 86 °F / 30 °C | Continuous* |
| 60 | Three-Phase | 0.5 - 2 | 0.37 - 1.5 | 2 | 3450 | 86 °F / 30 °C | Continuous* |
| 50 | Three-Phase | 0.5 - 2 | 0.37 - 1.5 | 2 | 2875 | 86 °F / 30 °C | Continuous* |

* 3 hp motors require 0.25 ft/sec flow past motor.

4-Inch Construction Materials

| Component | Construction Type | |
|----------------------|---------------------|-------------------------------|
| | Standard Water Well | Pollution Recovery |
| Castings | 304 SS over Iron | 304 SS over Iron |
| Stator Shell | 301 SS | 301 SS |
| Shaft Extension | 17-4 SS or 303 SS | 303 SS |
| Fasteners | 305 SS or 302 SS | 316 SS |
| Seal Cover | Acetal | Tefzel® |
| Seal | Nitrile Rubber Lip | Viton® |
| Diaphragm | Nitrile Rubber | Viton® |
| Slinger | Nitrile Rubber | Viton® |
| Lead Wire (or Cable) | XLPE | Lead not furnished with motor |
| Lead Potting | Epoxy | Lead not furnished with motor |
| Lead Jam Nut | 303 SS | Lead not furnished with motor |

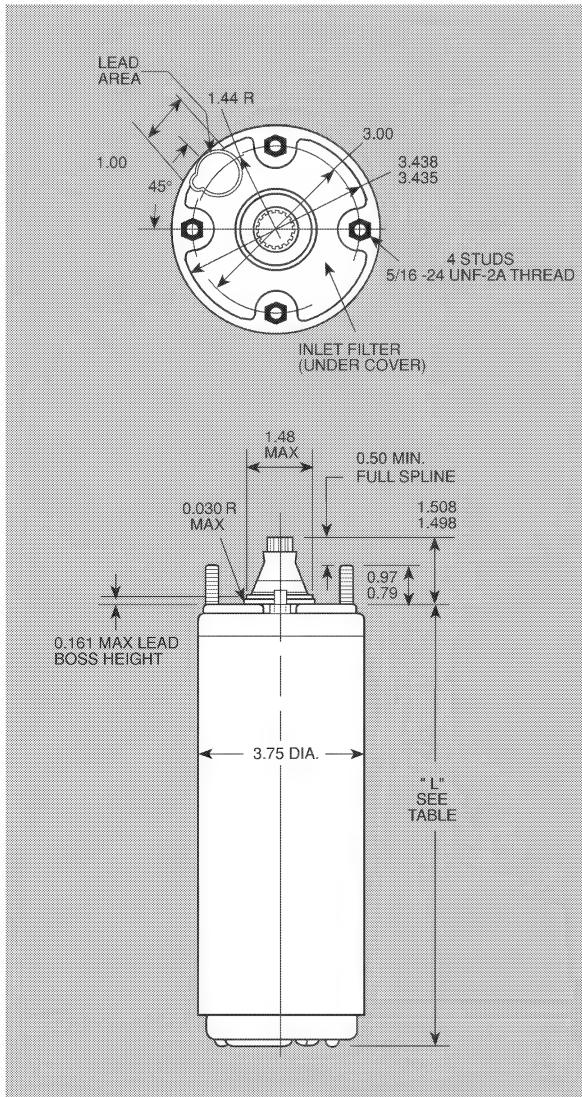
Specifications subject to change without notice. Contact Franklin Electric if current material types are required for bid specifications.

Viton® is a registered trademark of DuPont Dow Elastomers.

Tefzel® is a registered trademark of E.I. du Pont Nemours and Company.

4" Submersible Motors Super Stainless

4-Inch Dimensions and Weights



Single-Phase Motors - 2-wire

| HP | KW | "L" (inches) | SHIPPING WEIGHT | | MOTOR CARTON SIZE (in inches) |
|------|------|-----------------|-----------------|------|----------------------------------|
| | | | LBS | KG | |
| 1/3 | 0.25 | 8.78 | 16 | 7.3 | 4 x 4.375 x 16 |
| 0.5 | 0.37 | 9.53 | 18 | 8.2 | 4 x 4.375 x 16 |
| 0.75 | 0.55 | 10.66 | 21 | 9.5 | 4 x 4.375 x 19 |
| 1 | 0.75 | 11.75 | 24 | 10.9 | 4 x 4.375 x 19 |
| 1.5 | 1.1 | 15.12 | 31 | 14.1 | 4 x 4.375 x 21 |

Single-Phase Motors - 3-wire

| HP | KW | "L" (inches) | SHIPPING WEIGHT | | MOTOR CARTON SIZE (in inches) |
|------|------|-----------------|-----------------|------|----------------------------------|
| | | | LBS | KG | |
| 1/3 | 0.25 | 8.78 | 17 | 7.7 | 4 x 4.375 x 16 |
| 0.5 | 0.37 | 9.53 | 19 | 8.6 | 4 x 4.375 x 16 |
| 0.75 | 0.55 | 10.66 | 21 | 9.5 | 4 x 4.375 x 19 |
| 1 | 0.75 | 11.75 | 24 | 10.9 | 4 x 4.375 x 19 |
| 1.5 | 1.1 | 13.62 | 28 | 12.7 | 4 x 4.375 x 21 |
| 2 | 1.5 | 15.12 | 33 | 15.0 | 5 x 4.375 x 21 |
| 3 | 2.2 | 19.06 | 41 | 18.6 | 6 x 4.375 x 21 |

Three-Phase Motors

| HP | KW | "L" (inches) | SHIPPING WEIGHT | | MOTOR CARTON SIZE (in inches) |
|------|------|-----------------|-----------------|------|----------------------------------|
| | | | LBS | KG | |
| 0.5 | 0.37 | 9.53 | 18 | 8.2 | 4 x 4.375 x 16 |
| 0.75 | 0.55 | 10.66 | 21 | 9.5 | 4 x 4.375 x 16 |
| 1 | 0.75 | 11.75 | 24 | 10.9 | 4 x 4.375 x 19 |
| 1.5 | 1.1 | 11.75 | 24 | 10.9 | 4 x 4.375 x 19 |
| 2 | 1.5 | 13.62 | 28 | 12.7 | 4 x 4.375 x 21 |
| 3 | 2.2 | 16.06 | 35 | 15.9 | 4 x 4.375 x 21 |

All dimensions listed above are for models supplied with lead. Consult factory for other models.

4" Submersible Motors Super Stainless

4-Inch 2-wire Models

| HP (kW) | DESCRIPTION | | | | | | MODEL | STOCK STATUS | DOWNWARD THRUST RATING |
|---------------------------------|-------------|--------------------|-------|----|------|-------------|---------------|--------------|------------------------|
| | W/PH | CONSTRUCTION | VOLTS | HZ | S.F. | LEAD IN MTR | | | |
| 1/3 hp 0.25 kW | 2-WIRE | WATER WELL | 115 | 60 | 1.75 | | 244 502 01--S | | 300 LBS (1500 N) |
| | | | 115 | 60 | 1.75 | YES | 244 502 90--S | YES | |
| | | | 230 | 60 | 1.75 | | 244 503 01--S | | |
| | | | 230 | 60 | 1.75 | YES | 244 503 90--S | YES | |
| | | POLLUTION RECOVERY | 115 | 60 | 1.75 | | 244 502 09--S | | |
| | | | 230 | 60 | 1.75 | | 244 503 09--S | | |
| 1/2 hp 0.37 kW | 2-WIRE | WATER WELL | 115 | 60 | 1.60 | | 244 504 01--S | | 300 LBS (1500 N) |
| | | | 115 | 60 | 1.60 | YES | 244 504 90--S | YES | |
| | | | 220 | 50 | 1.00 | | 244 555 01--S | | |
| | | | 230 | 60 | 1.60 | | 244 505 01--S | | |
| | | | 230 | 60 | 1.60 | YES | 244 505 90--S | YES | |
| | | POLLUTION RECOVERY | 115 | 60 | 1.60 | | 244 504 09--S | | |
| | | | 230 | 60 | 1.60 | | 244 505 09--S | | |
| 3/4 hp 0.55 kW | 2-WIRE | WATER WELL | 220 | 50 | 1.00 | | 244 557 01--S | | 300 LBS (1500 N) |
| | | | 230 | 60 | 1.50 | | 244 507 01--S | | |
| | | | 230 | 60 | 1.50 | YES | 244 507 90--S | YES | |
| | | POLLUTION RECOVERY | 230 | 60 | 1.50 | | 244 507 09--S | | |
| 1 hp 0.75 kW | 2-WIRE | WATER WELL | 220 | 50 | 1.00 | | 244 558 12--S | | 650 LBS (3000 N) |
| | | | 230 | 60 | 1.40 | | 244 508 12--S | | |
| | | | 230 | 60 | 1.40 | YES | 244 508 90--S | YES | |
| | | POLLUTION RECOVERY | 230 | 60 | 1.40 | | 244 508 23--S | | |
| 1.5 hp 1.1 kW | 2-WIRE | WATER WELL | 220 | 50 | 1.00 | | 244 359 12--S | | 650 LBS (3000 N) |
| | | | 230 | 60 | 1.30 | | 244 309 12--S | | |
| | | | 230 | 60 | 1.30 | YES | 244 309 90--S | YES | |
| | | POLLUTION RECOVERY | 230 | 60 | 1.30 | | 244 309 23--S | | |

NOTES:

1. Pack Designation: --S = Single Pack, available in any quantity. All 3 hp motors are single-packed.
2. Contact factory for lead time for non-stocked items.
3. Pallet packs available but not shown. Please contact customer service for availability.

4" Submersible Motors Super Stainless

4-Inch 3-wire Models

| HP (KW) | DESCRIPTION | | | | | | MOTOR MODEL | CONTROL BOX MODEL | STOCK STATUS | DOWNWARD THRUST RATING |
|---------------------------------|-------------|--------------------|-------|----|------|-------------|---------------|-------------------|--------------|------------------------|
| | W/PH | CONSTRUCTION | VOLTS | HZ | S.F. | LEAD IN MTR | | | | |
| 1/3 hp 0.25 kW | 3-WIRE | WATER WELL | 115 | 60 | 1.75 | | 214 502 44--S | 280 102 49 | | 300 LBS (1500 N) |
| | | | 115 | 60 | 1.75 | YES | 214 502 90--S | 280 102 49 | YES | |
| | | | 220 | 50 | 1.00 | | 214 553 41--S | 280 353 01 | | |
| | | | 230 | 60 | 1.75 | | 214 503 44--S | 280 103 49 | | |
| | | | 230 | 60 | 1.75 | YES | 214 503 90--S | 280 103 49 | YES | |
| | | POLLUTION RECOVERY | 115 | 60 | 1.75 | | 214 502 49--S | 280 102 49 | | |
| 1/2 hp 0.37 kW | 3-WIRE | WATER WELL | 115 | 60 | 1.60 | | 214 504 44--S | 280 104 49 | | 300 LBS (1500 N) |
| | | | 115 | 60 | 1.60 | YES | 214 504 90--S | 280 104 49 | YES | |
| | | | 220 | 50 | 1.00 | | 214 555 41--S | 280 355 01 | YES | |
| | | | 230 | 60 | 1.60 | | 214 505 44--S | 280 105 49 | | |
| | | | 230 | 60 | 1.60 | YES | 214 505 90--S | 280 105 49 | YES | |
| | | POLLUTION RECOVERY | 115 | 60 | 1.60 | | 214 504 49--S | 280 104 49 | | |
| 3/4 hp 0.55 kW | 3-WIRE | WATER WELL | 220 | 50 | 1.00 | | 214 557 41--S | 280 357 01 | YES | 300 LBS (1500 N) |
| | | | 230 | 60 | 1.50 | | 214 507 44--S | 280 107 49 | | |
| | | | 230 | 60 | 1.50 | YES | 214 507 90--S | 280 107 49 | YES | |
| | | | 230 | 60 | 1.50 | | 214 507 49--S | 280 107 49 | | |
| | | | 230 | 60 | 1.50 | YES | 214 507 0600S | | YES | |
| | | SERIES 600M | 230 | 60 | 1.50 | | | | | |
| 1 hp 0.75 kW | 3-WIRE | WATER WELL | 220 | 50 | 1.00 | | 214 558 19--S | 280 358 01 | YES | 650 LBS (3000 N) |
| | | | 230 | 60 | 1.40 | | 214 508 12--S | 280 108 49 | | |
| | | | 230 | 60 | 1.40 | YES | 214 508 90--S | 280 108 49 | YES | |
| | | | 230 | 60 | 1.40 | | 214 508 23--S | 280 108 49 | | |
| | | | 230 | 60 | 1.40 | YES | 214 508 0610S | | YES | |
| | | SERIES 600M | 230 | 60 | 1.40 | | | | | |
| 1.5 hp 1.1 kW | 3-WIRE | WATER WELL | 220 | 50 | 1.00 | | 224 350 19--S | 282 350 81 | YES | 650 LBS (3000 N) |
| | | | 230 | 60 | 1.30 | | 224 300 19--S | 282 300 81 | YES | |
| | | | 230 | 60 | 1.30 | YES | 224 300 92--S | 282 300 81 | YES | |
| | | | 230 | 60 | 1.30 | | 224 300 23--S | 282 300 81 | | |
| | | | 230 | 60 | 1.30 | YES | 224 300 0610S | | YES | |
| | | SERIES 600M | 230 | 60 | 1.30 | | | | | |
| 2 hp 1.5 kW | 3-WIRE | WATER WELL | 220 | 50 | 1.00 | | 224 351 19--S | 282 351 81 | YES | 650 LBS (3000 N) |
| | | | 230 | 60 | 1.25 | | 224 301 19--S | 282 301 81 | YES | |
| | | | 230 | 60 | 1.25 | YES | 224 301 92--S | 282 301 81 | YES | |
| | | | 230 | 60 | 1.25 | | 224 301 23--S | 282 301 81 | | |
| | | | 230 | 60 | 1.25 | YES | 224 301 0610S | | YES | |
| | | SERIES 600M | 230 | 60 | 1.25 | | | | | |
| 3 hp 2.2 kW | 3-WIRE | WATER WELL | 220 | 50 | 1.00 | | 224 352 25 | 282 352 81 | YES | 900 LBS (4000 N) |
| | | | 230 | 60 | 1.15 | | 224 302 25 | 282 302 81 | | |
| | | | 230 | 60 | 1.15 | YES | 224 302 26 | 282 302 81 | YES | |
| | | | 230 | 60 | 1.15 | YES | 224 302 0620 | | YES | |
| | | | 230 | 60 | 1.15 | YES | | | | |
| | | SERIES 600M | 230 | 60 | 1.15 | | | | | |

NOTES:

1. Pack Designation: --S = Single Pack, available in any quantity. All 3 hp motors are single-packed.
2. Contact factory for lead time for non-stocked items.
3. Pallet packs available but not shown. Please contact customer service for availability.

Submersible Motor Control Boxes



Applications

QUICK DISCONNECT (QD) & CAPACITOR RUN CONTROL (CRC)
 – These control boxes are designed for use with Franklin 3-wire single-phase submersible motors through 1 hp.

STANDARD & DELUXE – These control boxes are designed for use with Franklin 3-wire single-phase submersible motors from 1 through 15 hp. Recommended for water systems that use pressure switches, level switches, or other pilot devices. Deluxe boxes (only) contain magnetic line contactors carefully matched to the motor rating, eliminating the need for external line contactors.

Basic Features – All Boxes

- Suitable for outdoor mounting
- Capacitor Start / Capacitor Run design (except QD boxes)
- UL Listed for US and Canada (60 Hz models)

Basic Features – Standard & Deluxe Boxes

- Heavy duty box-type terminals accept up to AWG #2 wire
- External access to overload resets
- Multiple-size knockouts
- User-friendly connection diagrams
- Easy access to grounding lugs

Single-Phase Control Box Specifications

| BOX TYPE | HZ | HP RANGE | KW RANGE | ENCLOSURE | TERMINAL BLOCK | | MAG CONTACTOR | AGENCY APPROVALS |
|-----------------------------|----|----------|-------------|---------------|----------------|----------|---------------|-----------------------------|
| | | | | | TERMINALS | MAX WIRE | | |
| Quick Disconnect (QD) | 60 | 1/3 - 1 | 0.25 - 0.75 | NEMA 3R, IP23 | 5 | AWG 10 | No | UL listed for US and Canada |
| Quick Disconnect (QD) | 50 | 1/3 - 1 | 0.25 - 0.75 | NEMA 3R, IP23 | 5 | AWG 10 | No | CSA Certified |
| Capacitor Run Control (CRC) | 60 | 1/2 - 1 | 0.37 - 0.75 | NEMA 3R, IP23 | 5 | AWG 10 | No | UL listed for US and Canada |
| Standard (S) | 60 | 1 - 10 | 0.75 - 7.5 | NEMA 3R, IP23 | 5 | AWG 2 | No | UL listed for US and Canada |
| Standard (S) | 50 | 1.5 - 5 | 0.75 - 3.7 | NEMA 3R, IP23 | 5 | AWG 2 | No | CSA Certified |
| Deluxe (D) | 60 | 2 - 15 | 1.5 - 11 | NEMA 3R, IP23 | 6 | AWG 2 | Yes | UL listed for US and Canada |
| Extra Large Deluxe (D-XL) | 60 | 15 | 11 | NEMA 3R, IP23 | 5 | AWG 00 | Yes | UL listed for US and Canada |

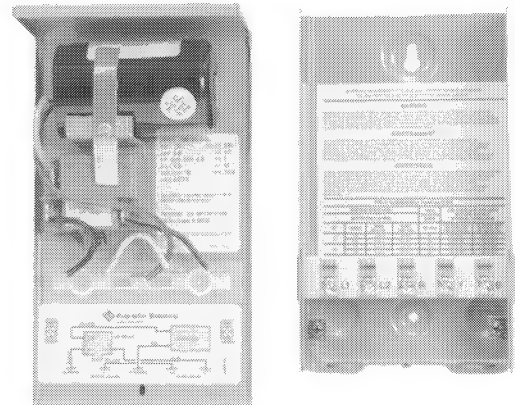
Submersible Motor Control Boxes

Enclosure – Quick Disconnect (QD) & Capacitor Run Control (CRC) Boxes

■ Knockouts:

- Bottom: Two 0.88” knockouts and one 1.31” knockout.
- Side: One 0.88” knockout and one 1.31” knockout on each side.

- #### ■ Terminal Block:
- Five terminals provided for wiring up to AWG #10 wire.



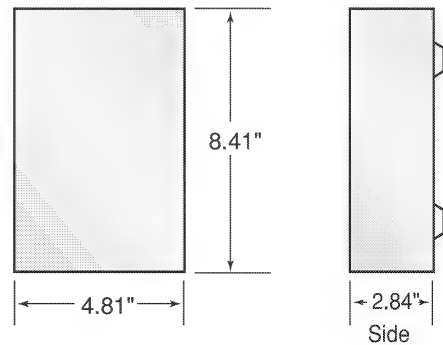
Quick Disconnect (QD) Control Boxes

| HP | KW | SHIPPING WEIGHT | | MOTOR CARTON SIZE (in inches) | ENC SIZE |
|-----|------|-----------------|-----|-------------------------------|----------|
| | | LBS | KG | | |
| 1/3 | 0.25 | 4 | 1.8 | 5.5 x 3.25 x 9 | QD |
| 1/2 | 0.37 | 4 | 1.8 | 5.5 x 3.25 x 9 | QD |
| 3/4 | 0.55 | 4 | 1.8 | 5.5 x 3.25 x 9 | QD |
| 1 | 0.75 | 4 | 1.8 | 5.5 x 3.25 x 9 | QD |

Capacitor Run Control (CRC) Boxes

| HP | KW | SHIPPING WEIGHT | | MOTOR CARTON SIZE (in inches) | ENC SIZE |
|-----|------|-----------------|-----|-------------------------------|----------|
| | | LBS | KG | | |
| 1/2 | 0.37 | 5 | 2.3 | 5.5 x 3.25 x 9 | QD |
| 3/4 | 0.55 | 5 | 2.3 | 5.5 x 3.25 x 9 | QD |
| 1 | 0.75 | 5 | 2.3 | 5.5 x 3.25 x 9 | QD |

QD Box Dimensions



Submersible Motor Control Boxes

Enclosure – Standard & Deluxe Boxes

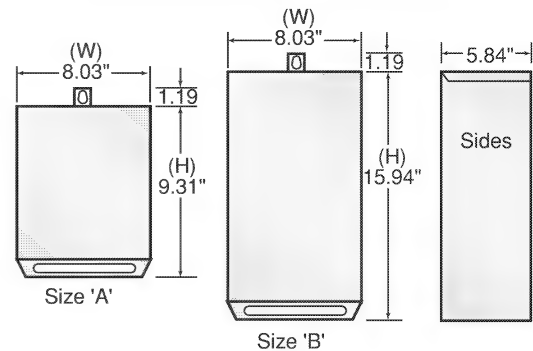
- **Knockouts:** Two 1.31" diameter holes for 1" conduit connection. One 1.75" knockout for 1.25" conduit. One 0.88" knockout for 0.5" conduit connection.
- **Terminal Block:** six terminals provided for wiring up to AWG 2 wire.



Standard & Deluxe Dimensions

Standard Control Boxes

| HP | KW | SHIPPING WEIGHT | | MOTOR CARTON SIZE (in inches) | ENC SIZE |
|-----------|-----|-----------------|-----|-------------------------------|----------|
| | | LBS | KG | | |
| 1.5 | 1.1 | 7 | 3.2 | 8.125 x 6.25 x 11.25 | A |
| 2 | 1.5 | 7 | 3.2 | 8.125 x 6.25 x 11.25 | A |
| 3 | 2.2 | 7 | 3.2 | 8.125 x 6.25 x 11.25 | A |
| 5 (60 Hz) | 3.7 | 8 | 3.6 | 8.125 x 6.25 x 11.25 | A |
| 5 (50 Hz) | 3.7 | 8 | 3.6 | 8.125 x 6.25 x 18 | B |
| 7.5 | 5.5 | 12 | 5.5 | 8.125 x 6.25 x 18 | B |
| 10 | 7.5 | 14 | 6.4 | 8.125 x 6.25 x 18 | B |



Deluxe Control Boxes

| HP | KW | SHIPPING WEIGHT | | MOTOR CARTON SIZE (in inches) | ENC SIZE |
|---------|-----|-----------------|------|-------------------------------|----------|
| | | LBS | KG | | |
| 2 | 1.5 | 7.0 | 3.2 | 8.125 x 6.25 x 11.25 | A |
| 3 | 2.2 | 7.3 | 3.3 | 8.125 x 6.25 x 11.25 | A |
| 5 | 3.7 | 11.2 | 5.1 | 8.125 x 6.25 x 18 | B |
| 7.5 | 5.5 | 13.1 | 6.0 | 8.125 x 6.25 x 18 | B |
| 10 | 7.5 | 14.7 | 6.7 | 8.125 x 6.25 x 18 | B |
| 15 | 11 | 16.5 | 7.5 | 8.125 x 6.25 x 18 | B |
| 15 (XL) | 11 | 28.0 | 12.7 | 16 x 7.125 x 19 | C |

Submersible Motor Control Boxes

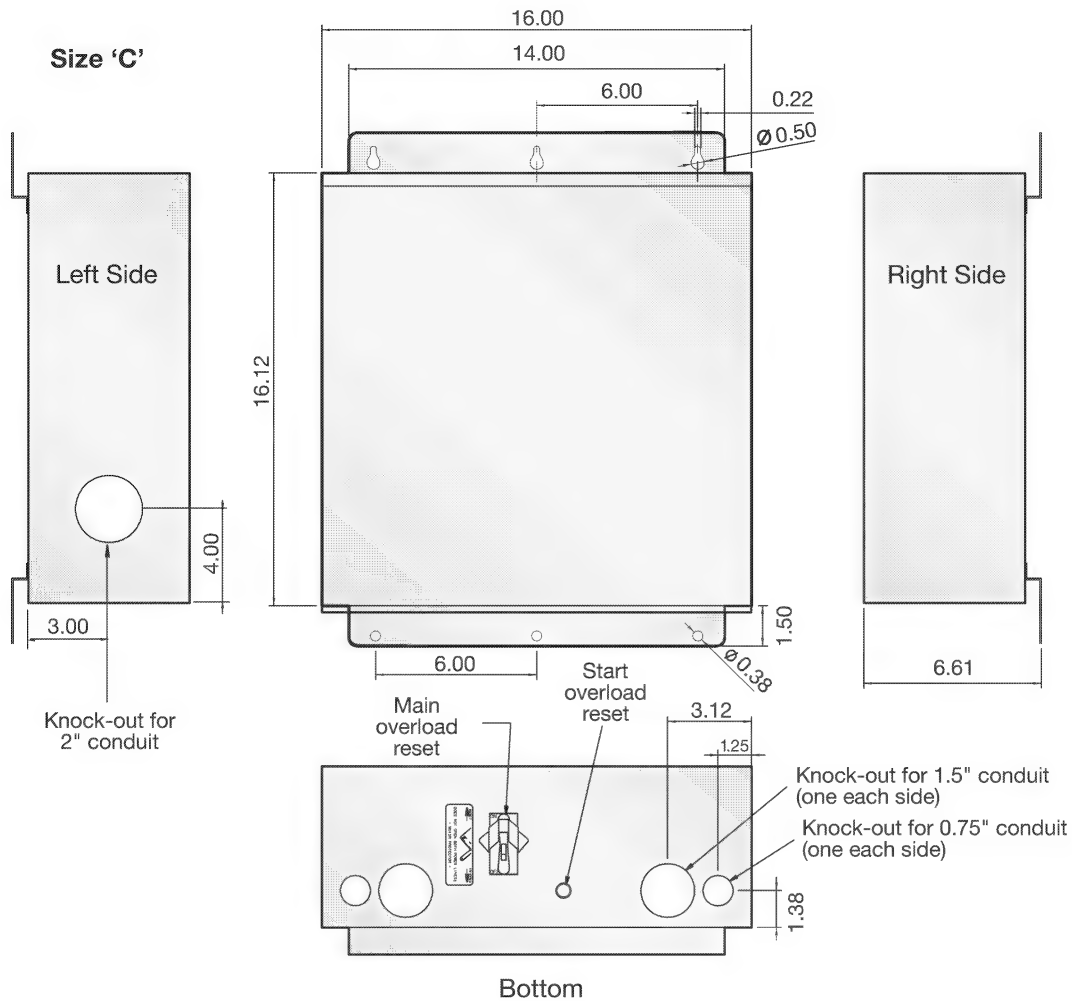
Enclosure - Extra Large Deluxe (D-XL) Boxes

■ Knockouts:

- Bottom: two knockouts for 0.75" conduit, and two for 1.5" conduit.
- Side: one knockout for 2" conduit.

■ Terminal Block: two terminals provided for incoming power and three terminals provided for drop cable for conductors from AWG 14 to 00.

■ Control Switch Terminal Block: accepts conductors from AWG 20 to 6.



Submersible Motor Control Boxes

Control Box Models

| HP (KW) | DESCRIPTION | | | | MODEL | STOCK STATUS |
|-------------------------|-------------|-------|----|------|--------------|--------------|
| | PH | VOLTS | HZ | TYPE | | |
| 1/3 hp (0.25 kW) | 1P | 115 | 60 | Q | 280 102 4915 | YES |
| | 1P | 220 | 50 | Q | 280 353 0115 | |
| | 1P | 230 | 60 | Q | 280 103 4915 | YES |
| 1/2 hp (0.37 kW) | 1P | 115 | 60 | Q | 280 104 4915 | YES |
| | 1P | 220 | 50 | Q | 280 355 0115 | YES |
| | 1P | 230 | 60 | Q | 280 105 4915 | YES |
| 3/4 hp (0.55 kW) | 1P | 230 | 60 | CRC | 282 405 5015 | YES |
| | 1P | 220 | 50 | Q | 280 357 0115 | YES |
| | 1P | 230 | 60 | Q | 280 107 4915 | YES |
| 1 hp (0.75 kW) | 1P | 230 | 60 | CRC | 282 407 5015 | YES |
| | 1P | 220 | 50 | Q | 280 358 0115 | YES |
| | 1P | 230 | 60 | Q | 280 108 4915 | YES |
| 1.5 hp (1.1 kW) | 1P | 230 | 60 | CRC | 282 408 5015 | YES |
| | 1P | 220 | 50 | S | 282 350 8110 | YES |
| | 1P | 230 | 60 | S | 282 300 8110 | YES |
| 2 hp (1.5 kW) | 1P | 220 | 50 | S | 282 351 8110 | YES |
| | 1P | 230 | 60 | S | 282 301 8110 | YES |
| | 1P | 230 | 60 | D | 282 301 8310 | YES |
| 3 hp (2.2 kW) | 1P | 220 | 50 | S | 282 352 8110 | YES |
| | 1P | 230 | 60 | S | 282 302 8110 | YES |
| | 1P | 230 | 60 | D | 282 302 8310 | YES |
| 5 hp (3.7 kW) | 1P | 220 | 50 | S | 282 253 9010 | YES |
| | 1P | 230 | 60 | S | 282 113 8110 | YES |
| | 1P | 230 | 60 | D | 282 113 9310 | YES |
| 7.5 hp (5.5 kW) | 1P | 230 | 60 | S | 282 201 9210 | YES |
| | 1P | 230 | 60 | D | 282 201 9310 | YES |
| 10 hp (7.5 kW) | 1P | 230 | 60 | S | 282 202 9230 | YES |
| | 1P | 230 | 60 | D | 282 202 9330 | YES |
| 15 hp (11 kW) | 1P | 230 | 60 | D | 282 203 9330 | YES |
| | 1P | 230 | 60 | D-XL | 282 203 9621 | YES |

NOTES:

Q = Quick Disconnect Control Box

CRC = Capacitor Run Control Box

S = Standard Control Box

D = Deluxe Control Box

D-XL = Extra Large Deluxe Control Box

Submersible Motor Control Boxes

Control Box Parts

QD Control Box Parts - 60 Hz

| HP Voltage Model No. | Rating | No. Req. | Component Part No. | Kit Order No. |
|---|------------------------------------|-------------|-----------------------|------------------|
| 1/3 hp - 115 V 280 102 4915 | Start Capacitor 159-191 MFD, 110 V | 1 | 275 464 125 | 305 207 925 |
| | QD Relay | 1 | 223 415 905 | 305 101 905 |
| 1/3 hp - 230 V 280 103 4915 | Start Capacitor 43-53 MFD, 220 V | 1 | 275 464 126 | 305 207 926 |
| | QD Relay | 1 | 223 415 901 | 305 101 901 |
| 1/2 hp - 115 V 280 104 4915 | Start Capacitor 250-300 MFD, 125 V | 1 | 275 464 201 | 305 207 951 |
| | QD Relay | 1 | 223 415 906 | 305 101 906 |
| 1/2 hp - 230 V 280 105 4915 | Start Capacitor 59-71 MFD, 220 V | 1 | 275 464 105 | 305 207 905 |
| | QD Relay | 1 | 223 415 902 | 305 101 902 |
| 3/4 hp - 230 V 280 107 4915 | Start Capacitor 86-103 MFD, 220 V | 1 | 275 464 118 | 305 207 918 |
| | QD Relay | 1 | 223 415 903 | 305 101 903 |
| 1 hp - 230 V 280 108 4915 | Start Capacitor 105-126 MFD, 220 V | 1 | 275 464 113 | 305 207 913 |
| | QD Relay | 1 | 223 415 904 | 305 101 904 |
| 1/2 hp - 230 V CRC 282 405 5015 | Start Capacitor 43-53 MFD, 220 V | 1 | 275 464 126 | 305 207 926 |
| | Run Capacitor 15 MFD, 370 V | 1 | 156 362 101 | 305 203 907 |
| | QD Relay | 1 | 223 415 912 | 305 105 901 |
| 3/4 hp - 230 V CRC 282 407 5015 | Start Capacitor 59-71 MFD, 220 V | 1 | 275 464 105 | 305 207 905 |
| | Run Capacitor 23 MFD, 370 V | 1 | 156 362 102 | 305 203 908 |
| | QD Relay | 1 | 223 415 913 | 305 105 902 |
| 1 hp - 230 V CRC 282 408 5015 | Start Capacitor 86-103 MFD, 220 V | 1 | 275 464 118 | 305 207 918 |
| | Run Capacitor 23 MFD, 370 V | 1 | 156 362 102 | 305 203 908 |
| | QD Relay | 1 | 223 415 914 | 305 105 903 |

QD Control Box Parts - 50 Hz

| HP Voltage Model No. | Rating | No. Req. | Component Part No. | Kit Order No. |
|---------------------------------------|----------------------------------|-------------|-----------------------|------------------|
| 1/3 hp - 220 V 280 353 0115 | Start Capacitor 43-53 MFD, 220 V | 1 | 275 461 123 | 305 205 923 |
| | Capacitor Overload Assembly | 1 | 151 033 957 | 305 218 957 |
| | Relay 220 V | 1 | 155 031 112 | 305 213 912 |
| 1/2 hp - 220 V 280 355 0115 | Start Capacitor 43-53 MFD, 220 V | 1 | 275 461 123 | 305 205 923 |
| | Capacitor Overload Assembly | 1 | 151 033 957 | 305 218 957 |
| | Relay 220 V | 1 | 155 031 112 | 305 213 912 |
| 3/4 hp - 220 V 280 357 0115 | Start Capacitor 59-71 MFD, 220 V | 1 | 275 461 108 | 305 205 908 |
| | Capacitor Overload Assembly | 1 | 151 033 918 | 305 218 918 |
| | Relay 220 V | 1 | 155 031 112 | 305 213 912 |
| 1 hp - 220 V 280 358 0115 | Start Capacitor 86-103 MFD, 220V | 1 | 275 461 106 | 305 205 906 |
| | Capacitor Overload Assembly | 1 | 151 033 906 | 305 218 906 |
| | Relay 220 V | 1 | 155 031 112 | 305 213 912 |

Replacement Parts for Older Style QD Control Boxes

| Description | Rating | No. Req. | Component Part No. | Kit Order No. |
|------------------------------------|----------------------------------|----------|--------------------|---------------|
| Voltage Relay Kit | 115 Volt with bracket and screws | 1 | 155 031 901 | 305 102 901 |
| | 230 Volt with bracket and screws | 1 | 155 031 902 | 305 102 902 |
| | 208 Volt with bracket and screws | 1 | 155 031 903 | 305 102 903 |
| Capacitor Overload Assembly | 1/3 hp, 115 Volt | 1 | 151 033 973 | 305 218 973 |
| | 1/3 hp, 230 Volt | 1 | 151 033 974 | 305 218 974 |
| | 1/2 hp, 115 Volt | 1 | 151 033 975 | 305 218 975 |
| | 1/2 hp, 230 Volt | 1 | 151 033 976 | 305 218 976 |
| | 3/4 hp, 230 Volt | 1 | 151 033 978 | 305 218 978 |
| | 1 hp, 230 Volt | 1 | 151 033 979 | 305 218 979 |
| | 1.5 hp, 230 Volt | 1 | 151 033 980 | 305 218 980 |
| Overload Kit | 1/3 hp, 115 Volt | 1 | NA | 305 100 901 |
| | 1/3 hp, 230 Volt | 1 | NA | 305 100 902 |
| | 1/2 hp, 115 Volt | 1 | NA | 305 100 903 |
| | 1/2 hp, 230 Volt | 1 | NA | 305 100 904 |
| | 3/4 hp, 230 Volt | 1 | NA | 305 100 905 |
| | 1 hp, 230 Volt | 1 | NA | 305 100 906 |

NOTE: Some Franklin motors, controls & parts are not stock items and may need to be special ordered.

Submersible Motor Control Boxes

Control Box Parts

Standard Control Box Parts - 60 Hz

| HP Size Model No. | Rating | No. Req. | Component Part No. | Kit Order No. |
|---|-------------------------------------|-------------|-----------------------|------------------|
| 1/1.5 hp - 4" 282 300 8110 | Start Capacitor 105-126 MFD, 220 V | 1 | 275 464 113 | 305 207 913 |
| | Run Capacitor 10 MFD, 370 V | 1 | 155 328 102 | 305 204 902 |
| | Overload | 1 | 275 411 107 | 305 215 907 |
| | Relay - 230 V* | 1 | 155 031 102 | 305 213 902 |
| 2 hp - 4" 282 301 8110 | Start Capacitor 105-126 MFD, 220 V | 1 | 275 464 113 | 305 207 913 |
| | Run Capacitor 20 MFD, 370 V | 1 | 155 328 103 | 305 204 903 |
| | Start Overload | 1 | 275 411 117 | 305 215 917 |
| | Run Overload | 1 | 275 411 113 | 305 215 913 |
| 3 hp - 4" 2823028110 | Relay - 230 V* | 1 | 155 031 102 | 305 213 902 |
| | Start Capacitor 208-250 MFD, 220 V | 1 | 275 463 111 | 305 206 911 |
| | Run Capacitor 45 MFD, 370 V | 1 | 155 327 109 | 305 203 909 |
| | Start Overload | 1 | 275 411 118 | 305 215 918 |
| 5 hp - 4" & 6" 282 113 8110 | Run Overload | 1 | 275 411 115 | 305 215 915 |
| | Relay - 230 V* | 1 | 155 031 102 | 305 213 902 |
| | Start Capacitor 270-324 MFD, 330 V | 1 | 275 468 119 | 305 208 919 |
| | Run Capacitor 40 MFD, 370 V | 2 | 155 327 114 | 305 203 914 |
| 7.5 hp - 6" 282 201 9210 | Start Overload | 1 | 275 411 119 | 305 215 919 |
| | Run Overload | 1 | 275 406 102 | 305 214 902 |
| | Relay - 230V* | 1 | 155 031 601 | 305 213 961 |
| | Start Capacitor 270-324 MFD, 330 V | 1 | 275 468 119 | 305 208 919 |
| 10 hp - 6" 282 202 9230 | Start Capacitor 216-259 MFD, 330 V | 1 | 275 468 118 | 305 208 918 |
| | Run Capacitor 45 MFD, 370 V | 1 | 155 327 109 | 305 203 909 |
| | Start Overload | 1 | 275 411 102 | 305 215 902 |
| | Run Overload | 1 | 275 406 122 | 305 214 922 |
| All | Relay - 230V* | 1 | 155 031 601 | 305 213 961 |
| | Start Capacitor 270-324 MFD, 330 V | 1 | 275 468 119 | 305 208 919 |
| | Start Capacitor 130-154 MFD, 330 V | 1 | 275 463 120 | 305 206 920 |
| | Start Capacitor 216-259 MFD, 330 V | 1 | 275 468 118 | 305 208 918 |
| 208 V Relay * | Run Capacitor 35 MFD, 370 V | 2 | 155 327 102 | 305 203 902 |
| | Start Overload | 1 | 275 406 103 | 305 214 903 |
| | Run Overload | 1 | 155 409 101 | 155 409 101 |
| | Relay - 230V* | 1 | 155 031 601 | 305 213 961 |
| All | Lightning Arrestor | 1 | 150 814 902 | 150 814 902 |
| | Relay 1.5-3 hp (replaces 155031102) | 1 | 155 031 103 | 305 213 903 |
| 208 V Relay * | Relay 5-15 hp (replaces 155031601) | 1 | 155 031 602 | 305 213 904 |

Standard Control Box Parts - 50 Hz

| HP Voltage Model No. | Rating | No. Req. | Component Part No. | Kit Order No. |
|---------------------------------------|------------------------------------|-------------|-----------------------|------------------|
| 1.5 hp - 220 V 282 350 8110 | Start Capacitor 105-126 MFD, 220 V | 1 | 275 464 113 | 305 207 913 |
| | Run Capacitor 10 MFD, 370 V | 1 | 155 328 102 | 305 203 909 |
| | Overload Assembly - Run | 1 | 275 411 114 | 305 215 914 |
| | Relay 220 V | 1 | 155 031 112 | 305 213 912 |
| 2 hp - 220 V 282 351 8110 | Start Capacitor 189-227 MFD, 220 V | 1 | 275 468 115 | 305 208 915 |
| | Run Capacitor 20 MFD, 370V | 1 | 155 328 103 | 305 204 903 |
| | Overload Assembly - Run | 1 | 275 411 102 | 305 215 902 |
| | Overload Assembly - Start | 1 | 275 411 106 | 305 215 906 |
| 3 hp - 220 V 282 352 8110 | Relay 220 V | 1 | 155 031 112 | 305 213 912 |
| | Start Capacitor 270-324 MFD, 220 V | 1 | 275 468 119 | 305 208 919 |
| | Run Capacitor 35 MFD, 370 V | 1 | 155 327 102 | 305 203 902 |
| | Overload Assembly - Run | 1 | 275 406 107 | 305 214 907 |
| 5 hp - 220 V 282 253 9010 | Overload Assembly - Start | 1 | 275 411 107 | 305 215 907 |
| | Relay 220 V | 1 | 155 031 112 | 305 213 912 |
| | Start Capacitor 189-227 MFD, 220 V | 2 | 275 468 115 | 305 208 915 |
| | Run Capacitor 30 MFD, 220 V | 1 | 155 327 101 | 305 203 901 |
| 5 hp - 220 V 282 253 9010 | Run Capacitor 45 MFD, 220 V | 1 | 155 327 109 | 305 203 909 |
| | Overload Assmby - Run | 1 | 275 406 102 | 305 214 902 |
| | Overload Assembly - Start | 1 | 275 411 102 | 305 215 902 |
| | Relay 220 V | 1 | 155 031 112 | 305 213 912 |

NOTE: Some Franklin motors, controls and parts are not stock items and may need to be special ordered.

* For 208 V systems or where line voltage is between 200 V and 210 V a low voltage relay and larger cable are required:

- Use relay part number 155 031 103 in place of 155 031 102 on 1.5 through 3 hp applications.
- Use relay 115 031 602 for 5-15 hp applications.
- Use the next size larger cable than is specified in the 230 V table.
- Boost transformers are an alternative to special relay and cable.

Submersible Motor Control Boxes

Control Box Parts

Deluxe Control Box Parts

| HP Size Model No. | Rating | No. Req. | Component Part No. | Kit Order No. |
|---|---------------------------------------|----------|-----------------------|---------------|
| 2 hp - 4" 282 301 8310 | Start Capacitor 105-126 MFD, 220 V | 1 | 275 464 113 | 305 207 913 |
| | Run Capacitor 20 MFD, 370 V | 1 | 155 328 103 | 305 204 903 |
| | Start Overload | 1 | 275 411 117 | 305 215 917 |
| | Run Overload | 1 | 275 411 113 | 305 215 913 |
| | Contactor | 1 | 155 325 102 | 305 226 901 |
| | Relay - 230 V* | 1 | 155 031 102 | 305 213 902 |
| 3 hp - 4" 282 302 8310 | Start Capacitor 208-250 MFD, 220 V | 1 | 275 463 111 | 305 206 911 |
| | Run Capacitor 45 MFD, 370 V | 1 | 155 327 109 | 305 203 909 |
| | Start Overload | 1 | 275 411 118 | 305 215 918 |
| | Run Overload | 1 | 275 411 115 | 305 215 915 |
| | Contactor | 1 | 155 325 102 | 305 226 901 |
| | Relay - 230 V* | 1 | 155 031 102 | 305 213 902 |
| 5 hp - 4" & 6" 282 113 9310 | Start Capacitor 270-324 MFD, 330 V | 1 | 275 468 119 | 305 208 919 |
| | Run Capacitor 40 MFD, 370 V | 2 | 155 327 114 | 305 203 914 |
| | Start Overload | 1 | 275 411 119 | 305 215 919 |
| | Run Overload | 1 | 275 406 102 | 305 214 902 |
| | Contactor | 1 | 155 326 101 | 305 347 903 |
| | Relay - 230 V* | 1 | 155 031 601 | 305 213 961 |
| 7.5 hp - 6" 282 201 9310 | Start Capacitor 270-324 MFD, 330 V | 1 | 275 468 119 | 305 208 919 |
| | Start Capacitor 216-259 MFD, 330 V | 1 | 275 468 118 | 305 208 918 |
| | Run Capacitor 45 MFD, 370 V | 1 | 155 327 109 | 305 203 909 |
| | Start Overload | 1 | 275 411 102 | 305 215 902 |
| | Run Overload | 1 | 275 406 121 | 305 214 921 |
| | Contactor | 1 | 155 326 102 | 305 347 902 |
| 10 hp - 6" 282 202 9330 | Relay - 230 V* | 1 | 155 031 601 | 305 213 961 |
| | Start Capacitor 270-324 MFD, 330 V | 1 | 275 468 119 | 305 208 919 |
| | Start Capacitor 130-154 MFD, 330 V | 1 | 275 463 120 | 305 206 920 |
| | Start Capacitor 216-259 MFD, 330 V | 1 | 275 468 118 | 305 208 918 |
| | Run Capacitor 35 MFD, 370 V | 2 | 155 327 102 | 305 203 902 |
| | Start Overload | 1 | 275 406 103 | 305 214 903 |
| 15 hp - 6" 282 203 9330 | Run Overload | 1 | 155 409 101 | 155 409 101 |
| | Contactor | 1 | 155 326 102 | 305 347 902 |
| | Relay - 230 V* | 1 | 155 031 601 | 305 213 961 |
| | Start Capacitor 270-324 MFD, 330 V | 2 | 275 468 119 | 305 208 919 |
| | Start Capacitor 161-193 MFD, 330 V | 1 | 275 463 122 | 305 206 912 |
| | Run Capacitor 45 MFD, 370 V | 3 | 155 327 109 | 305 203 909 |
| 15 hp - 6" 282 203 9621 X-Large Enclosure | Start Overload | 1 | 275 406 103 | 305 214 903 |
| | Run Overload | 1 | 155 409 102 | 155 409 102 |
| | Contactor | 1 | 155 429 101 | 305 347 901 |
| | Relay - 230 V* | 1 | 155 031 601 | 305 213 961 |
| | Start Capacitor 350-420 MFD, 330 V | 2 | 275 468 120 | 305 208 920 |
| | Run Capacitor 45 MFD, 370 V | 3 | 155 327 109 | 305 203 909 |
| All | Start Overload | 1 | 275 406 103 | 305 214 903 |
| | Run Overload | 1 | 155 409 102 | 155 409 102 |
| | Contactor | 1 | 155 429 101 | 305 347 901 |
| | Relay - 230 V* | 2 | 155 031 601 | 305 213 961 |
| | Lightning Arrestor | 1 | 150 814 902 | 150 814 902 |
| | Relay 1.5-3 hp (replaces 155 031 102) | 1 | 155 031 103 | 305 213 903 |
| 208 V Relay* | Relay 5-15 hp (replaces 155 031 601) | 1 | 155 031 602 | 305 213 904 |

NOTE: Some Franklin motors, controls & parts are not stock items and may need to be special ordered.

* For 208 V systems or where line voltage is between 200 V and 210 V a low voltage relay and larger cable are required:

- Use relay part number 155 031 103 in place of 155 031 102 on 1.5 through 3 hp applications.
- Use relay 115 031 602 for 5-15 hp applications.
- Use the next size larger cable than is specified in the 230 V table.
- Boost transformers are an alternative to special relay and cable.

CONTROLPRES™

by WATERTech

DOMESTIC PUMP CONTROL

OWNER'S MANUAL

1 1/4" connections

115 / 230 Vac DUAL VOLTAGE UNIT



File No: E191502 Mod. CP

FEATURES & BENEFITS

CONTROLPRES can be installed on surface and submersible pumps for residential, domestic irrigation and booster systems.

- Provides for an adjustable downstream pressure.
- Increases pump life.
- Maintains constant pressure and flow.
- Can be used with surface or submersible pumps.
- Eliminates pump pressure switch.
- Dual voltage 115 / 230 VAC.
- Built-in pressure and flow switch.
- No adjustment or maintenance required.
- Built-in check valve.
- Simple installation saves space and time.
- Built-in dry-run protection.
- Can be used with or without pressure tank.
- Assists in absorbing water hammer.

READ THESE INSTRUCTIONS CAREFULLY BEFORE INSTALLATION

INSTALLER - PLEASE LEAVE THIS MANUAL WITH THE UNIT OR GIVE TO END USER.

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PLEASE READ BEFORE PROCEEDING WITH INSTALLATION

FAILURE TO READ AND CONSIDER SAFETY INSTRUCTIONS IN THIS MANUAL OR ON CONTROLPRES MAY RESULT IN PERSONAL INJURY OR SERIOUS DAMAGE TO PIPING OR FIXTURES !



This is the safety alert. When you see this symbol in this manual, look for one of the following signal words and be alert to the potential for personal injury.



DANGER

Warns about hazards that **will** cause serious personal injury, death or major property damaged if ignored.



WARNING

Warns about hazards that **can** cause serious personal injury, death or major property damaged if ignored.



DANGER

Hazardous pressure.



WARNING

Under certain conditions, submersible pumps can develop extremely high pressure. Install a pressure reducing valve to limit pressure to safe levels for application. Be sure well is equipped with a pressure relief valve.



Do not allow pump, CONTROLPRES, piping, or any other system component containing water to freeze. Freezing may damage system, leading to injury or flooding. Allowing CONTROLPRES or system components to freeze will void warranty.



DANGER

Hazardous voltage.



WARNING

Can shock, burn or cause death.



Install ground and wire CONTROLPRES according to local code and National Electrical Code requirements.



Depressurize the system and disconnect power supply before installing or servicing CONTROLPRES.



Make sure line voltage and frequency of power supply match motor nameplate voltage and frequency and CONTROLPRES voltage and frequency.

Install CONTROLPRES according to all plumbing, pump and well code requirements.

Pipe joint compound can cause cracking in plastic. Use only Teflon tape when sealing joints in plastic pipe or connecting pipe to thermoplastic pumps and CONTROLPRES.





For threaded conduit opening - To be used with UL Listed or Recognized, liquid-tight non-metallic (plastic) conduit fittings.

The manufacturer is not responsible or liable for damage due to improper installation or use.

TECHNICAL SPECIFICATIONS

| | |
|-------------------------------------|--------------------------|
| - Single phase power-supply voltage | 115 / 230 VAC |
| - Voltage variation tolerance | +/- 10 % |
| - Frequency | 50 / 60 Hz |
| - Full load amp rating 115 VAC | 16 FLA |
| - Full load amp rating 230 VAC | 20 FLA |
| - Electronic box | NEMA 12 enclosure |
| - Threaded conduit connections | ½" NPT |
| - Max working pressure | 174 psi |
| - Pressure adjusting range | min 45 psi max 95 psi |
| - Max working temperature | 149 °F (65°C) |
| - Inlet / Outlet connections | 1 ¼" MNPT |

OPERATION

-  **Power On** (green)
 - Displays when power is connected to CONTROLPRES unit.
 - In the event of a temporary power outage, CONTROLPRES resets automatically when power is restored.
-  **Pump On** (yellow)
 - Displays when pump is running.
-  **Failure** (red)
 - Displays when there is a problem with the system.
-  **Restart** (red)
 - Press and hold to reset for 3-5 seconds (with a tap opened). Green "Power On" light and yellow "Pump On" should display. This indicates system is operating properly.
 - If red "Failure" light come back on, refer to Troubleshooting Guide.

TROUBLESHOOTING (Excluding by-pass installation)

| Type of problem | Caused by system |
|--|--|
| Pump does not start | Check wiring connections. Check inlet piping, see page 6. |
| Pump turns on and off (short-cycles) | Leakage lower than minimum flow. |
| Pump does not stop | Water flow above minimum flow. |
| No water flow | Suction problems. |
| Low or no pressure at highest point of system | Refer to Pressure Section page 7. |
| Excessive pressure system | Pump oversized for system. Install pressure reducing valve. |
| Pump runs +/- 8 seconds after flow to system stops | OK - Pump is repressuring system. |

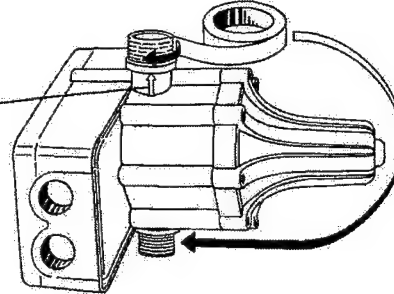
MAINTENANCE AND SPARE PARTS

Device requires no maintenance.
 The electronic box may be supplied as spare parts.

HYDRAULIC CONNECTION TO THE SYSTEM

Prepare all threads with Teflon tape only.

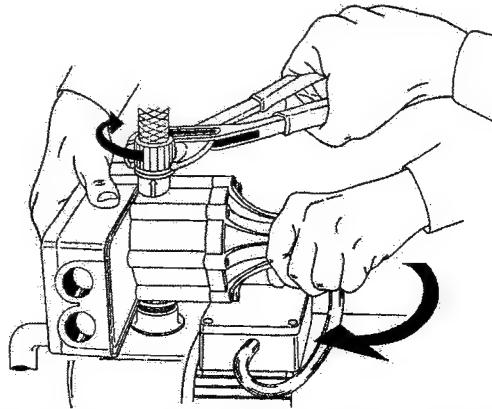
Flow
Direction



Connect device directly to pump outlet.
 Do not install any tee or tap between pump and CONTROLPRES Unit.

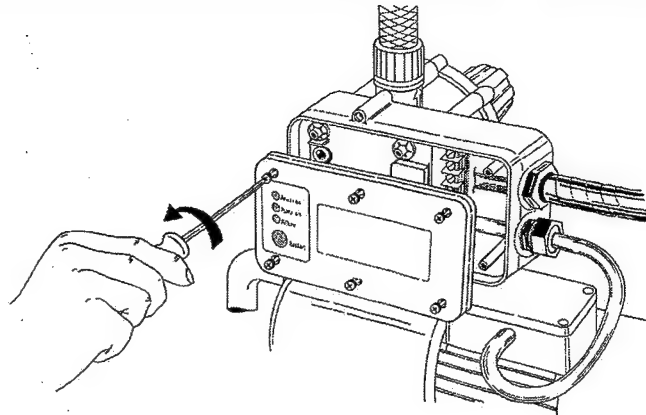
Always install CONTROLPRES with flow arrows in the vertical position. Electronic box should be level.

Do not over tighten water connections, especially when installing with metal couplings. Damage to CONTROLPRES may result.



CONDUIT CONNECTIONS

Open the electronic box cover by removing the six screws from the cover.

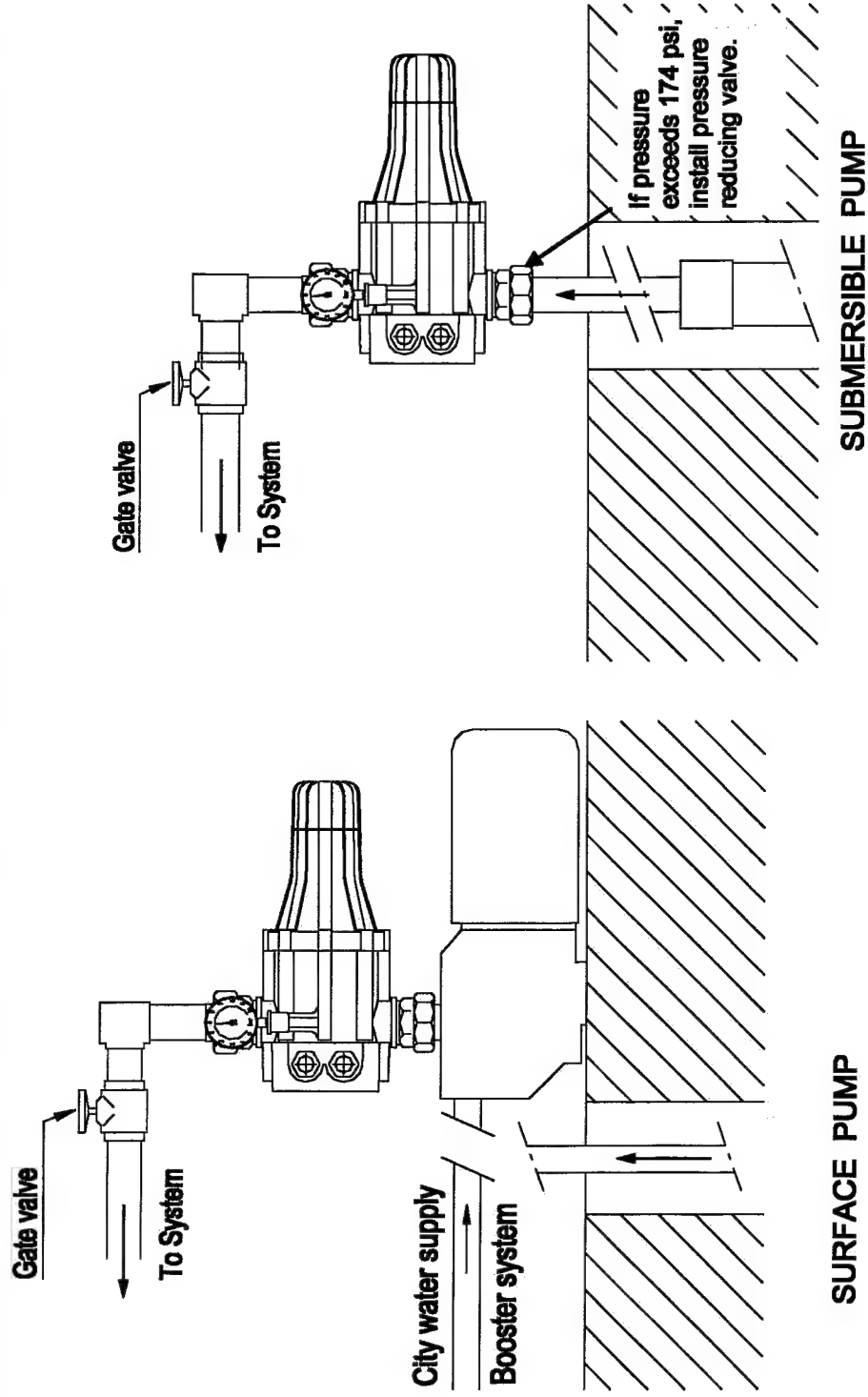


Line voltage and pump wires to the CONTROLPRES should be supplied through "liquid-tight" nonmetallic conduit fittings rated "NEMA 12" or "UL type 12" to achieve NEMA Type 12 enclosure rating.

Failure to install unit without use of liquid tight conduit, voids warranty!

TYPICAL CONTROLPRES INSTALLATION ON SURFACE AND SUBMERSIBLE PUMPS

CONTROLPRES can be installed on surface and submersible pumps for residential, domestic irrigation and booster systems.

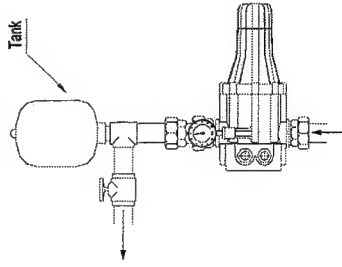


CONTROLPRES INSTALLATION GUIDELINES AND WARNINGS

PLEASE READ PRECAUTIONS AND WARNINGS ON PAGE 2 BEFORE PROCEEDING WITH INSTALLATION

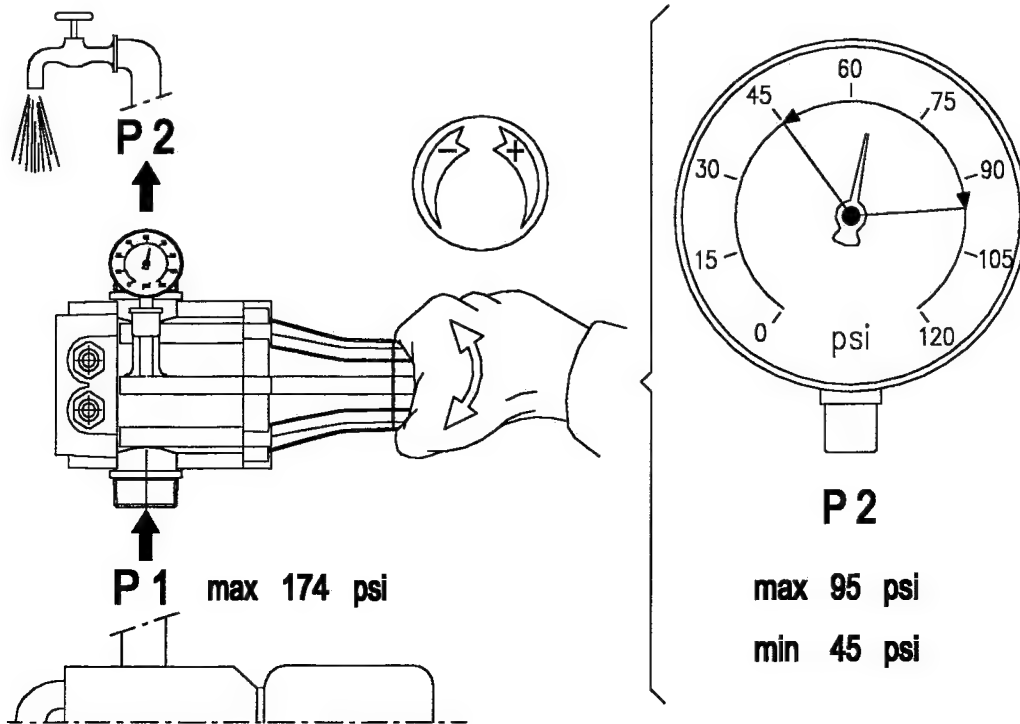
- **CONTROLPRES provides for an adjustable downstream pressure between 45 psi to 95 psi.**
- Must always be installed in the **vertical position**, flow arrows up, electronic box level.
- Must always be installed between the pump and the first tap or tee.
- Do not install any tap or tee between the pump and the CONTROLPRES.
- **Always install a gate valve after the CONTROLPRES unit. This allows testing of the pump and CONTROLPRES unit for efficiency and to confirm pump pressure.**
- Install a pressure-reducing valve between pump and CONTROLPRES when maximum pressure generated by the pump exceeds 174 psi.
- CONTROLPRES's rated maximum operating pressure is 174 psi (tested at 696 psi).
- Use only Teflon tape for CONTROLPRES connections. Pipe dope causes failures !
- Always confirm pump and system characteristics before installation, see "PRESSURE" paragraph.
- Always confirm line pressure after installation.
- **Remove pressure switch from pump and wire CONTROLPRES directly to pump.**
- Confirm electrical characteristics of pump motor before installation, e.g. full load amps and voltage.
- Install CONTROLPRES only in clean water applications.

CONTROLPRES INSTALLATION WITH PRESSURE TANK OPTION



A small captive air tank (1/2 to 2 gallons) may be used to supply a minimal flow demand such as a glass of water, ice maker machine, reverse osmosis systems, toilet flush, etc.
 The small tank will feed the low flow application and substantially delay the pump start-up.

PRESSURE



CONTROLPRES has a built-in pressure reducing valve, allowing for downstream pressure adjustment according to system requirements.

System pressure can be adjusted between minimum 45 psi and maximum 95 psi.

Open a tap to turn on the pump, close the tap and wait until pump stops, then check the system pressure on the unit pressure gauge, normally factory preset at 45 psi.

PRESSURE ADJUSTING PROCEDURE

Open a tap.

TO INCREASE THE PRESSURE turn the knob in the rear part of the unit clockwise.

TO DECREASE THE PRESSURE turn the knob counterclockwise.

Close the tap, wait for pump to stop and check the adjusted pressure.

Repeat the above operations until the desired pressure is obtained.

System pressure must be lower of 25 psi than the pressure generated by the pump and higher than the pressure generated by the column of water on the CONTROLPRES.

Use the appropriate guidelines below to check different adjusting conditions:

System pressure adjusted at 45 psi.

- Max pressure generated by the pump must be at least 70 psi.
- The column of water between CONTROLPRES and the highest tap must not exceed 40 feet.

System pressure adjusted at 55 psi.

- Max pressure generated by the pump must be at least 80 psi.
- The column of water between CONTROLPRES and the highest tap must not exceed 60 feet.

System pressure adjusted at 65 psi.

- Max pressure generated by the pump must be at least 90 psi.
- The column of water between CONTROLPRES and the highest tap must not exceed 80 feet.

System pressure adjusted at 75 psi.

- Max pressure generated by the pump must be at least 100 psi.
- The column of water between CONTROLPRES and the highest tap must not exceed 100 feet.

System pressure adjusted at 85 psi.

- Max pressure generated by the pump must be at least 110 psi.
- The column of water between CONTROLPRES and the highest tap must not exceed 120 feet.

System pressure adjusted at 95 psi.

- Max pressure generated by the pump must be at least 120 psi.
- The column of water between CONTROLPRES and the highest tap must not exceed 140 feet.

In the event the pump pressure does not reach the value stated above, the unit will go into Failure mode and will not restart the pump.

In the event the high of the water column exceeds the level indicated, the unit will not restart the pump.

To overcome these problems install CONTROLPRES at a higher level in order to recreate the above mentioned conditions, otherwise adjust system pressure to higher value.

ELECTRICAL CONNECTIONS



WARNING

OBSERVE WARNINGS AND PRECAUTIONS LISTED AT THE FRONT OF THIS MANUAL.

Electrical connections should be made by a qualified professional in compliance with applicable local codes and National Electric Code.



DANGER

ALWAYS SHUT OFF POWER FOR INSTALLATION OR SERVICE.

Check voltage of pump and supply to determine pump motor FLA and follow applicable CONTROLPRES wiring diagram. If pump motor FLA exceeds CONTROLPRES rating, use magnetic starter wiring diagram for the applicable voltage (see pages 12, 13).



WARNING

Device must be properly grounded.

Use 140 / 167 °F Wire.

Use Copper Conductors only.

IMPORTANT

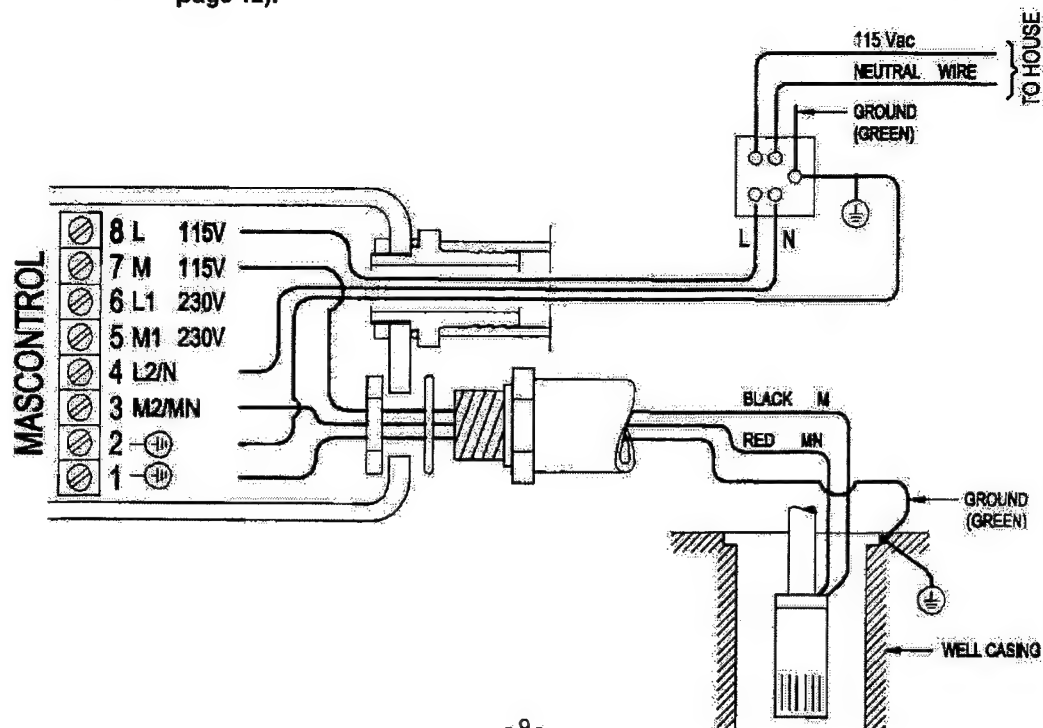
Remove pressure switch from surface pump and wire CONTROLPRES directly to pump.

INSTALLATION WIRING DIAGRAM - 115VAC 2-WIRE PUMPS



WARNING

For 115Vac motors exceeding 16 full load amps, use magnetic starter to avoid damage to CONTROLPRES. (See magnetic starter wiring diagram, page 12).

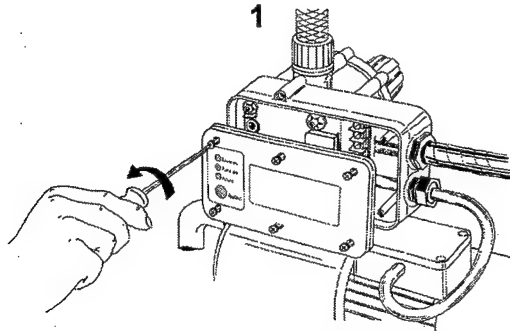


ELECTRONIC BOX REPLACEMENT

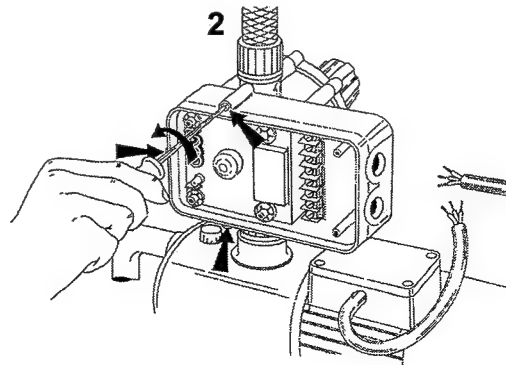


WARNING

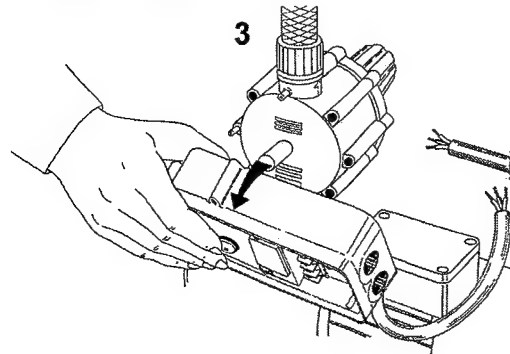
Prior to removing the electronic box ensure that power to unit is off and unit is depressurized.



- 1) Remove the box cover and disconnect the electrical wires.

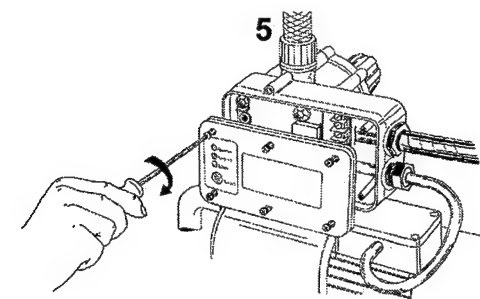
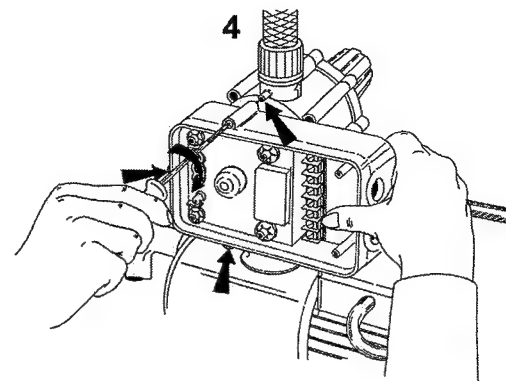


- 2) Take off the box by removing the three screws attaching the electronic box to the unit body.



- 3) Remove the electronic box.

- 4) Install the new electronic box and tighten the three screws. Do not overtighten or damage to threads may result.



- 5) Tighten the six screws on the cover of the electronic box to ensure water tight seal.

If cover is not securely fastened, RESET button will not operate.

WARNING: Do not turn on power until the box cover has been securely fastened.

WHEN TO USE CONTACTORS

Use a contactor when:

- On 115V installations pump motor full load amps exceed 16 FLA.
- On 230V installations pump motor full load amps exceed 20 FLA.
- On all three-phase applications.

Use of magnetic starter is determined by pump motor. If required, use contactor in conjunction with starter.

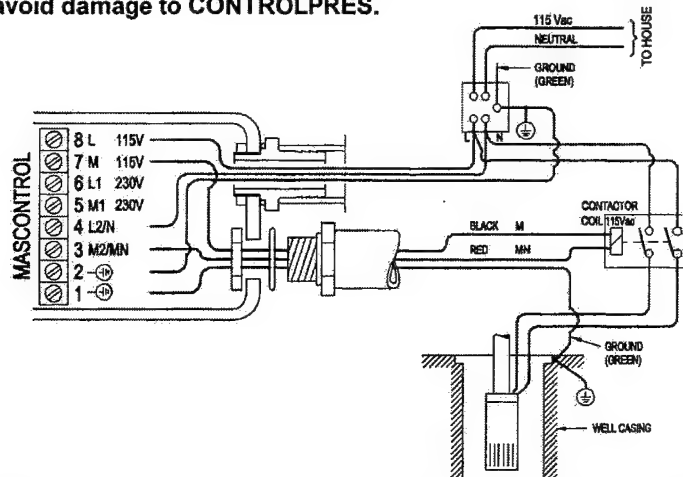
Remember, match coil voltage on contactor with CONTROLPRES voltage. Either 115V or 230V coils may be used.

INSTALLATION WIRING DIAGRAM - 115VAC 2-WIRE PUMPS EXCEEDING 16 FLA

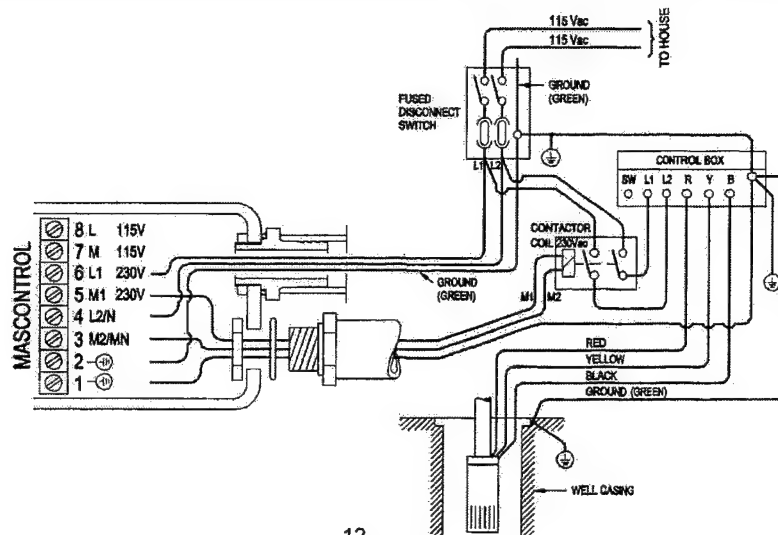


WARNING

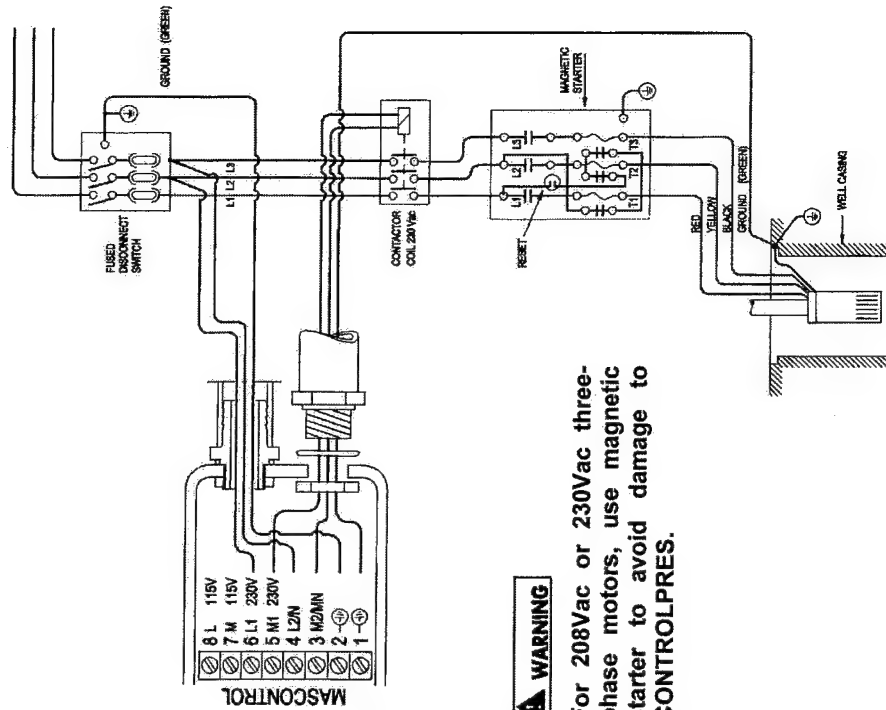
For 115Vac motors exceeding 16 full load amps, use magnetic starter to avoid damage to CONTROLPRES.



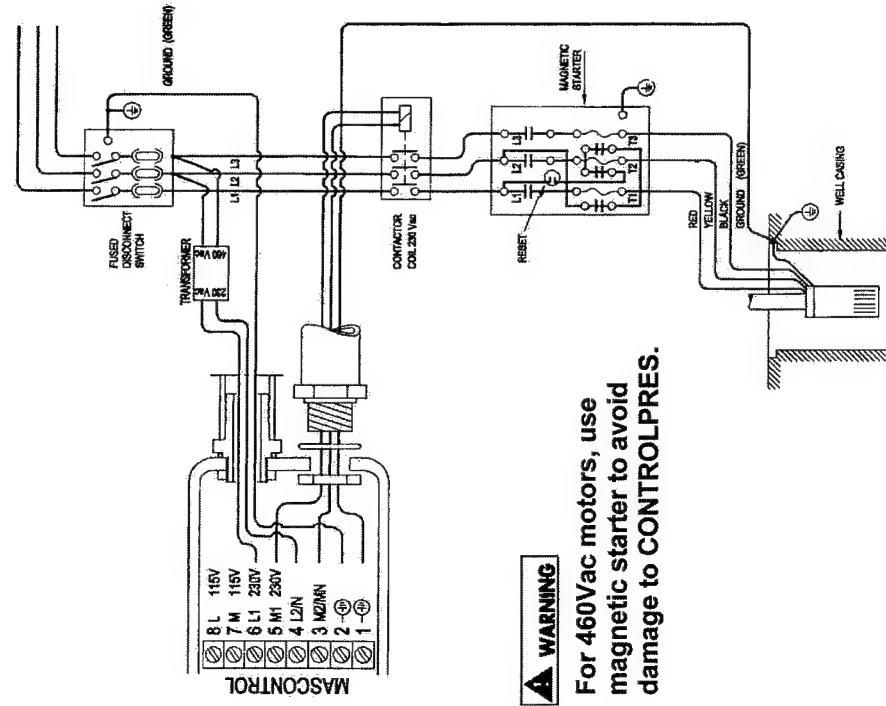
INSTALLATION WIRING DIAGRAM - 230VAC - SINGLE PHASE 3-WIRE PUMPS EXCEEDING 20 FLA



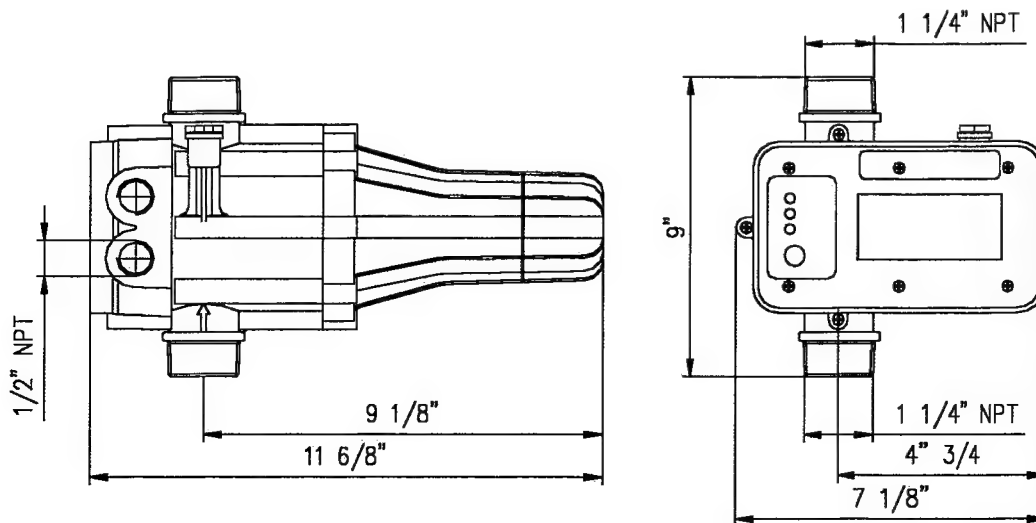
INSTALLATION WIRING DIAGRAM - 208 VAC OR 230 VAC THREE PHASE - 3-WIRE PUMPS



INSTALLATION WIRING DIAGRAM - 460VAC



OVERALL DIMENSIONS



WARRANTY

THE WARRANTY PERIOD IS 2 YEARS FROM INSTALLATION DATE

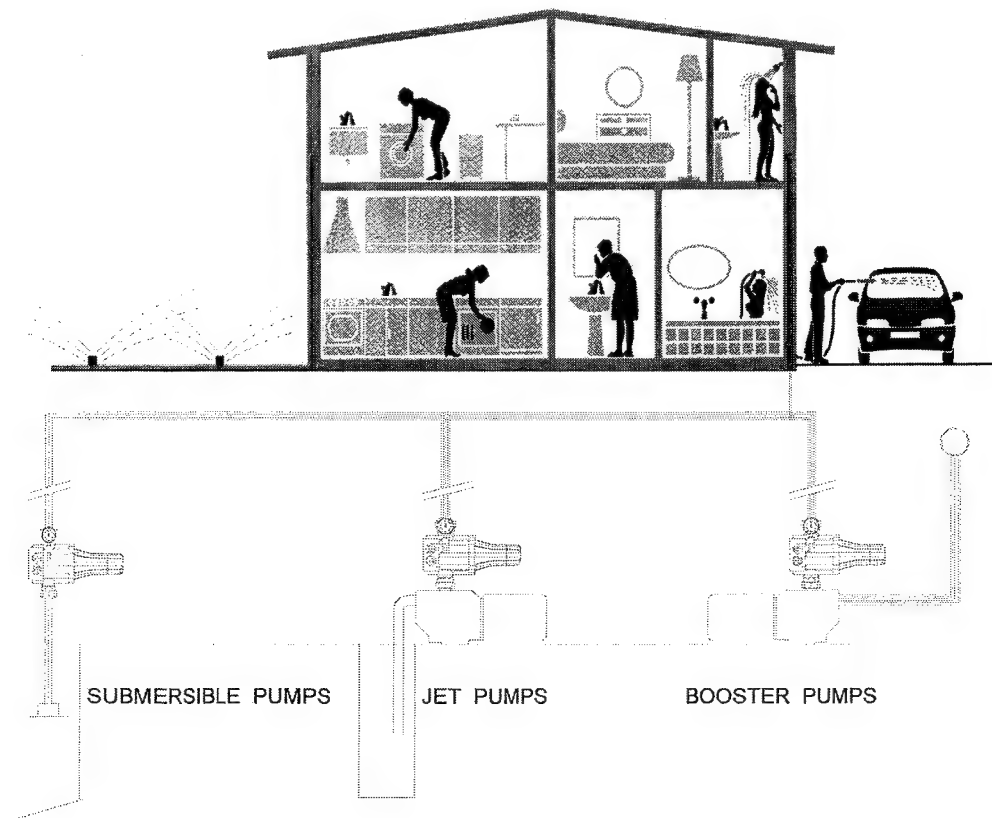
WARRANTY AND DISCLAIMER OF WARRANTY

The following warranty for the product is in lieu of all other conditions or warranties, whether express, implied or statutory, including but not limited to any implied conditions or warranties of merchantability or fitness for a particular purpose and on any implied conditions or warranty obligation on the part of manufacturer or its distributors, which are hereby expressly disclaimed. CONTROLPRES is warranted to be free of defects occurring either in hydraulic or electronic parts for a period of one year from the date of installation when installed by a licensed professional in accordance with the product manual and due professional care. Manufacturer reserves the right to inspect and evaluate defective units prior to warranty claim settlement. Improper installation, application or mishandling of unit voids the warranty.

CONTROLPRES™

by WATERTech

DOMESTIC PUMP CONTROL



Locally distributed by:

Accessories



- **Mascontrol**
- **Controlpres**
- **Well Tanks**
- **Expansion Tanks**
- **MonoDrive**
- **SubDrive**
- **Pumptec**
- **Pumptec Plus**

WaterGroup

Mascontrol

An intelligent system

Mascontrol is the newest product innovation providing optimum control for electric pumps used in residential and commercial plumbing and irrigation systems. An intelligent mix of hydraulic and electronic engineering, Mascontrol monitors both pressure and flow and automatically controls pump operations. Mascontrol eliminates the use of expansion tanks needed with traditional systems. No plenum chambers to recharge, and no irritating variations in pressure and flow at the point of use. No risk of the pump running dry. No adjustment or maintenance is required. Much more compact than traditional tank systems, Mascontrol is absolutely dependable, durable and simple to install. Over one million units currently in use across Europe.



Mascontrol is the most advanced economical solution for controlling electric pumps.

Features of Operation

- Eliminates pressure tank and switch
- Maintains constant pressure and flow
- Built-in check valve
- Built-in run-dry sensor
- Dual voltage 115 V or 230 V
- Absorbs water hammer
- Simple installation saves time and space
- No adjustment or maintenance required
- Can be used with surface or submersible pumps

Features of Construction

Mascontrol includes a hydraulic section and electronic control box.

The hydraulic section comprises:

- a molded housing in reinforced plastic.
- a diaphragm and spring responsive to variations in pressure.
- a valve responsive to variations in flow.
- a check valve
- safety valve preventing any water leakage in case of diaphragm break down

The electronic section comprises:

- a NEMA 12 electronic box molded in self extinguishing plastic.
- an individually-tested electronic circuit board protected by insulating film.
- a relay with special contacts and an electrical life of over 300,000 cycles or approximately 10 years (continuous rating).
- a varistor protecting against voltage peaks.

Materials

| | |
|-----------------------|--|
| Housing | Glass fiber reinforced polyamide PA 6 FV 30% |
| Diaphragm | EPDM |
| Spring | Steel C 72 UNI 3545 |
| Flow valve | Stainless steel AISI 304 |
| Check valve | Glass fiber reinforced polyamide PA 6 FV 30% |
| Control box | Self extinguishing thermoplastic resin 94 - 5 VA |
| Printed circuit | Vetronite |

Warranty - 2 years



Listed by Underwriters
 Laboratories Inc. to U.S.
 and Canadian safety
 standards



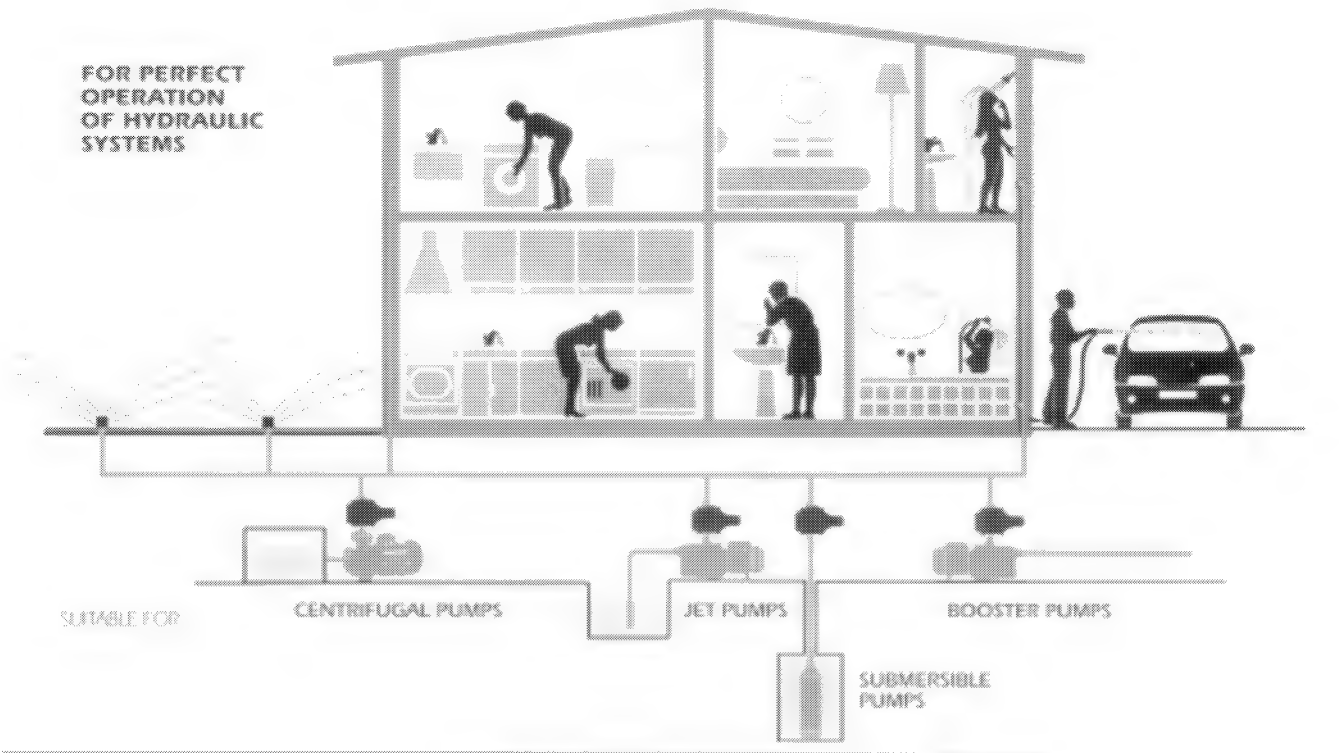
Fully in compliance with
 current EEC directives

Mascontrol

Mascontrol is available in 1" and 1-1/4" models. By utilizing a bypass, the Mascontrol is adaptable to almost any flow and horse power pump. Product warranty is two years from installation date (see footnote below). Replacement parts are the electronic box and hydraulic body - no rebuilds required.

- Mascontrol 1" - for flows up to 15GPM
- Mascontrol 1-1/4" - for flows up to 25GPM
- Use bypass application with either model for flows in excess of 25 GPM.

- Item # 79980** Mascontrol, 1" NPT, 50 feet (suitable for 50 feet maximum elevation above Mascontrol)
- Item # 79983** Mascontrol, 1" NPT, 70 feet (suitable for 70 feet maximum elevation above Mascontrol)
- Item # 79984** Mascontrol, 1" NPT, 90 feet (suitable for 90 feet maximum elevation above Mascontrol)
- Item # 79985** Mascontrol, 1-1/4" NPT, 50 feet (suitable for 50 feet maximum elevation above Mascontrol)
- Item # 79986** Mascontrol, 1-1/4" NPT, 70 feet (suitable for 70 feet maximum elevation above Mascontrol)

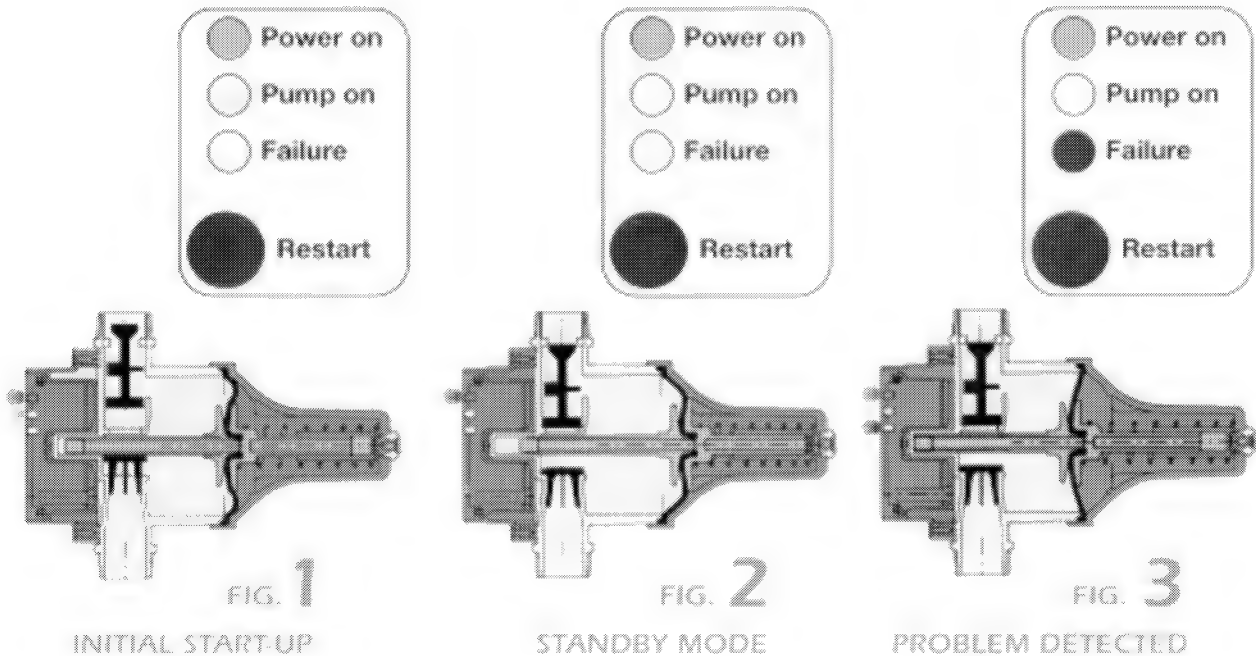


WARRANTY AND DISCLAIMER OF WARRANTY

The following warranty for the product is in lieu of all other conditions or warranties, whether express, implied or statutory, including but not limited to any implied conditions or warranties of merchantability or fitness for a particular purpose and on any other condition or warranty obligation on the part of the manufacturer or its distributors, which are hereby expressly disclaimed. Mascontrol is warranted to be free of defects occurring either in hydraulic or electronic parts for a period of two years from date of installation when installed by a licensed professional in accordance with the product manual and due professional care. The manufacturer reserves the right to inspect and evaluate defective units prior to warranty claim settlement. Improper installation, application or rehandling of unit voids the warranty.

WaterGroup

Mascontrol



The system's easy operating steps are displayed by indicator lights on a small panel at the front of the control box. Two of these will light up when the Mascontrol is connected to the power supply: **Power on** (green) and **Pump on** (yellow), indicating that the circuit is powered up and the pump is running (see Fig. 1). The pump will continue to operate for a few seconds so that pressure can be established in the system.

At this point, the pump is automatically shut off and switched to the standby mode (green light on), ready to respond to the various monitoring and control signals generated by the system (Fig. 2). Whenever a tap or valve is opened, the pump is immediately started by the Mascontrol unit and continues to run as long as the tap remains open (Fig. 1).

When the tap is closed, the Mascontrol unit shuts off the pump and returns the system to maximum pressure and reverts to the standby mode (Fig. 2).

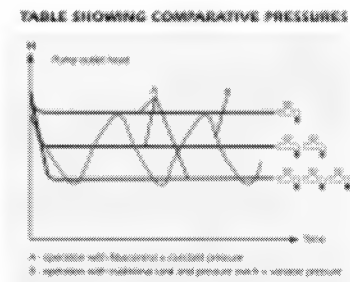
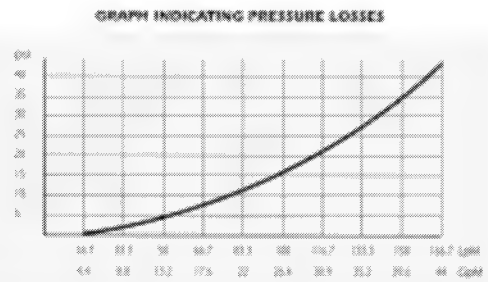
Irregular operating conditions such as a dry or blocked inlet line, etc., are recognized by the **Failure light** (red light on). The pump is shut off immediately.

Once the problem is corrected the user need only press the red Restart button to restore normal operation (Fig. 3).

If power is lost, the Mascontrol system will reset and restart automatically when power is restored.

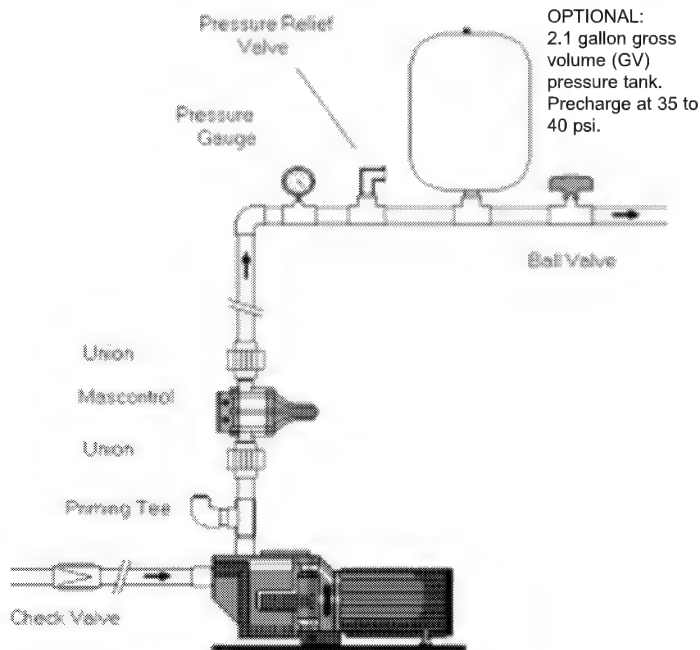
Technical Specifications

- Dual voltage 115V / 230V
- Acceptable power fluctuations $\pm 10\%$
- Frequency 50/60 Hz
- Amp rating 115V-16FLA / 230V-20FLA
- Use starter for higher amp draws**
- Electronic enclosure NEMA 12
- Maximum operating pressure 116 PSI
- Operating temperature .. 32-149°F (0-65°C)
- Male threaded connections 1" NPT
- Electrical conduit connections 1/2"



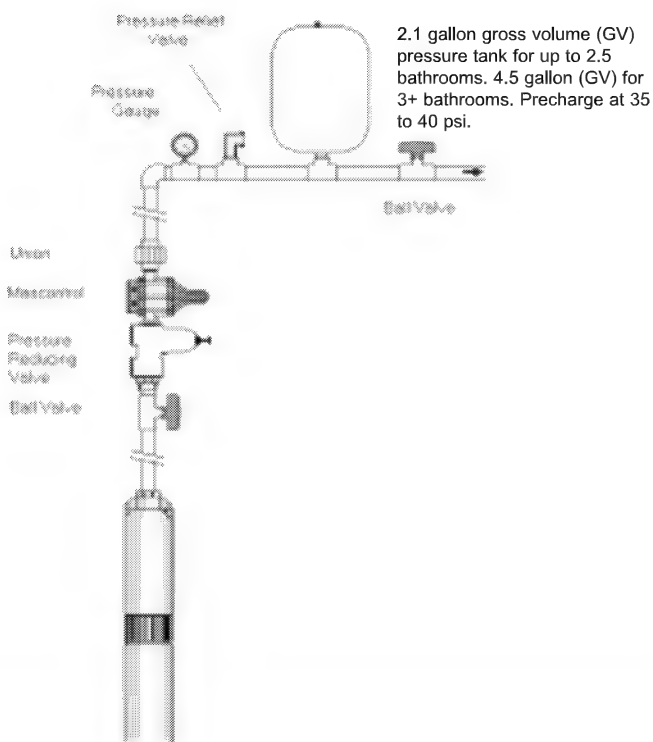
Mascontrol Installation Diagram

Surface Pump - Residential Application



The pressure tank is optional. The tank, if used, provides a “cushion” for small demands such as icemakers, reverse osmosis systems, leaks, glasses of water, etc. The tank precharge should be set at 35 to 40 PSI or generally not less than 20 PSI below the system pressure. With single stage surface pumps, system pressure is usually between 50 and 60 PSI. Do not install a pressure tank larger than 8.6 gallons gross volume as the system may perform like a standard tank set-up. Be sure to install a ball valve on the main after the Mascontrol for system maintenance. Gate valves may be used instead of ball valves. Remove the pressure switch from the pump (if supplied) and wire the Mascontrol directly to the pump.

Submersible Pump - Residential Application



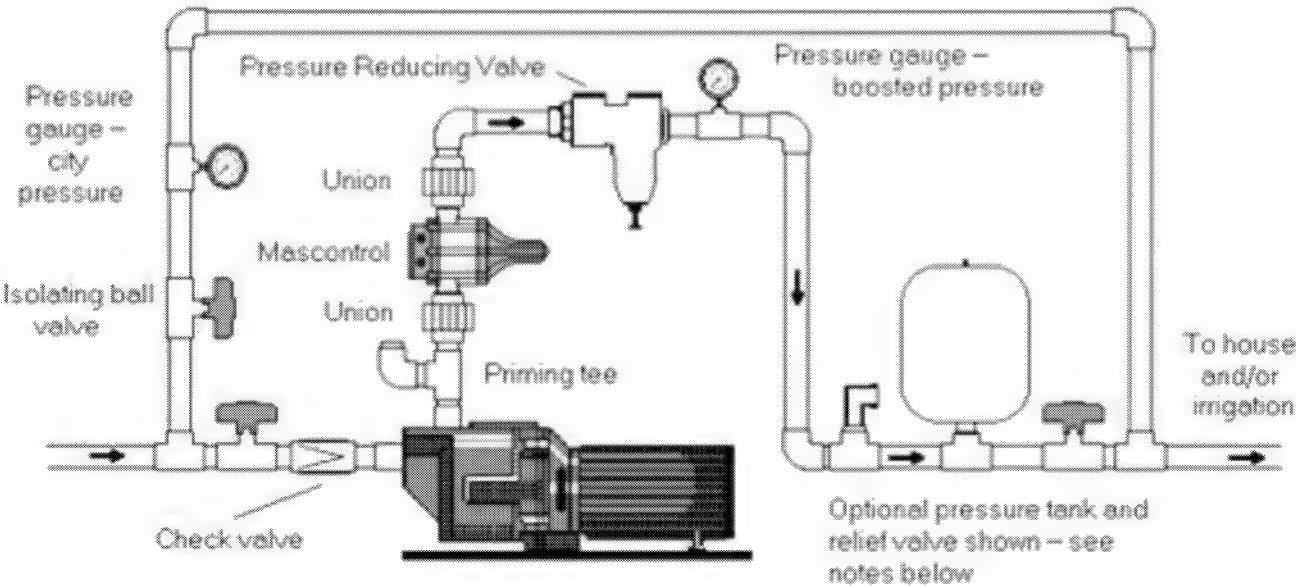
The submersible system may be operated without a tank for 3-wire submersible systems, however the tank provides a “cushion” for small demands such as icemakers, reverse osmosis systems, leaks, glasses of water, etc. The tank precharge should be set at 35 to 40 PSI or generally not less than 20 PSI below the system pressure. Do not install a pressure tank larger than 8.6 gallons gross volume as the system may perform like a standard tank set-up. Irrigation systems do not require a tank unless the system has significant leaks. The pressure reducing valve provides safe water pressures to the house as submersible pumps are usually capable of producing significantly higher pressure than is needed for the home or application. The ball valves shown are for system maintenance. At least one ball valve should be placed after the Mascontrol on the main. Gate valves may be used instead of ball valves.

PRV not required with Controlpres. Be sure all pipe & fittings are capable of handling the maximum pressure of the pumps.

WaterGroup

Mascontrol City Water Booster Pump Application Isolation Bypass Shown

**Diagram shows OPTIONAL Pressure Reducing Valve and
 OPTIONAL Pressure Tank - See below**



Pressure Reducing Valve -

Required only if incoming city pressure PLUS pump's maximum pressure exceeds desired service pressure. If city pressure fluctuates use highest pressure reading and use pump's maximum pressure to arrive at total surface pressure. Most residential booster pumps will generate at least 50 to 55 PSI. Follow local codes on maximum in-house water pressure. If irrigation requires higher pressure, tee off after the Mascontrol but before the pressure reducing valve to supply the irrigation system with the highest pressure available. Do not tee off BEFORE the Mascontrol

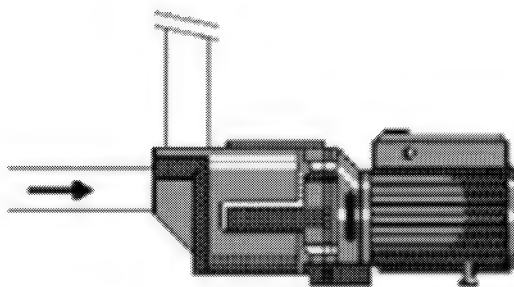
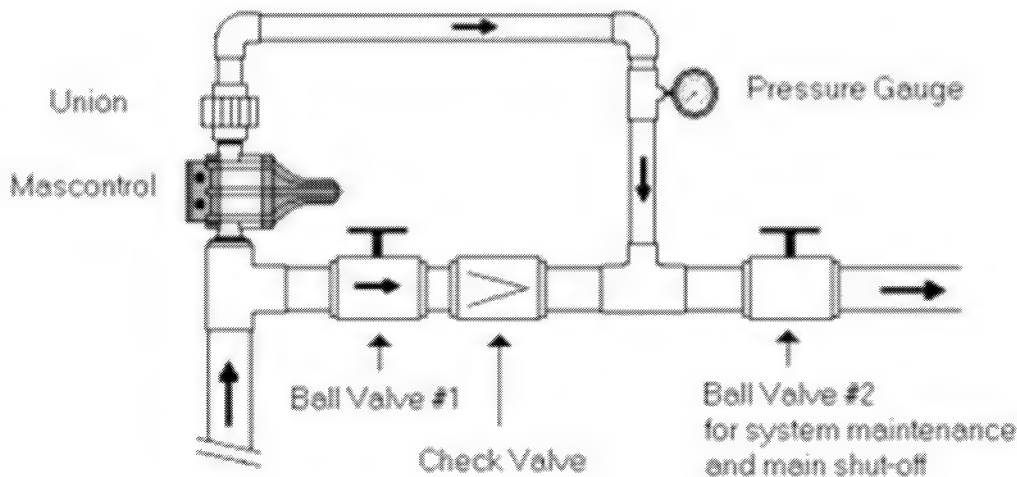
Pressure Tank and Relief Valve -

OPTIONAL - The Mascontrol provides "on demand" pump control. To prevent the pump from starting for small water uses such as ice makers, glasses of water, etc., install a 2.1 gallon gross volume pressure tank (example PJR6) AFTER the Mascontrol and pressure reducing valve (if one is installed). Precharge pressure tank to between 35 and 40 PSI, BUT NOT LESS THAN 20 PSI below system pressure. DO NOT install pressure switch. The tank will "feed" small demands. When the tank is emptied, the Mascontrol will start the pump and repeat pump cycling. On larger homes (3 or more bathrooms) a 4.5 gross volume tank may be used, such as a WX102, JR15 or WM18L. Precharge according to above instructions. A pressure relief valve may be added as dictated by local code.

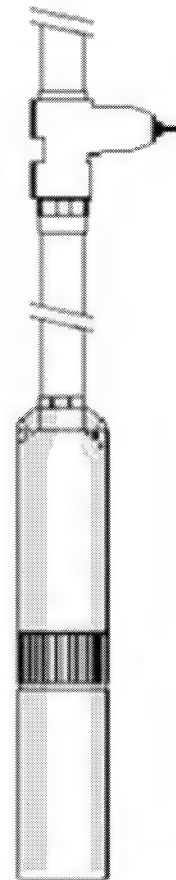
Mascontrol Bypass Application

With 1" Mascontrol use on flows above 15 GPM

With 1-1/4" Mascontrol use on flows above 25 GPM



Pressure
Reducing
Valve

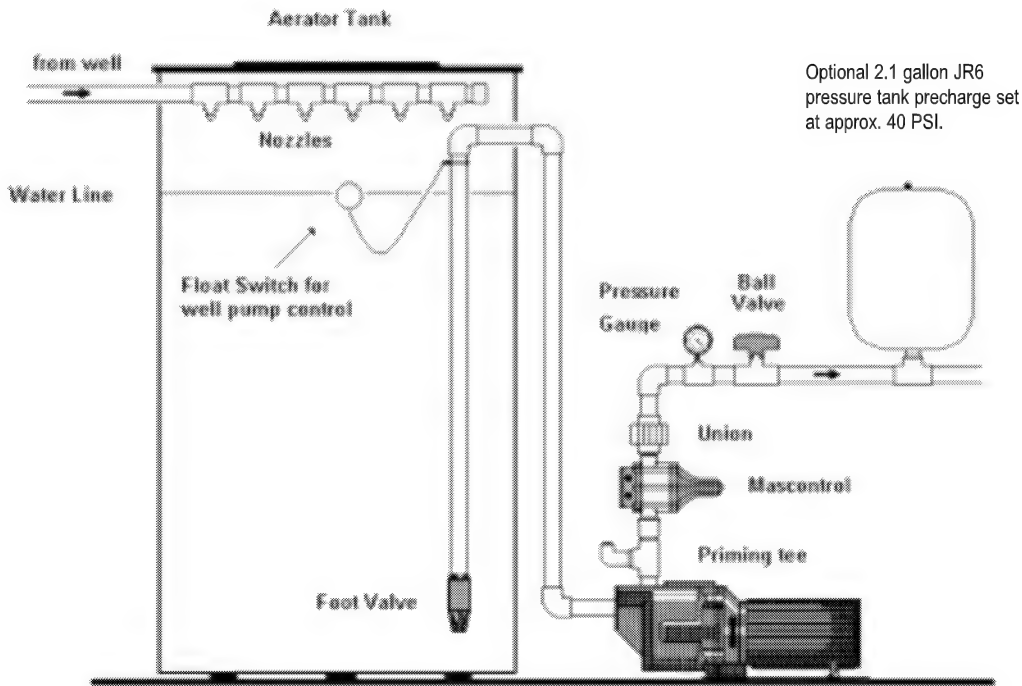


Ball valve #1 is used to provide back-pressure to the pump and also to throttle more water into the bypass if necessary. Pressure reducing valve shown on submersible is used when maximum head pressure is greater desired system pressure. In most cases, a pressure reducing valve will be required as most submersibles are capable of generating much more PSI than is required, especially with varying flow rates. If rapid cycling occurs, the bypass/Mascontrol is not getting enough flow and ball valve #1 should be adjusted (more closed) to force additional water into the bypass. Note that as less of the pump's capacity is used, flow slows down/pressure increases and water will follow the least resistant path - the main line. Fast cycling on a particular zone (when the other zones run normal) usually indicates an undersized zone. Check the pressure gauge to see if pressure rises significantly on the cycling zone.

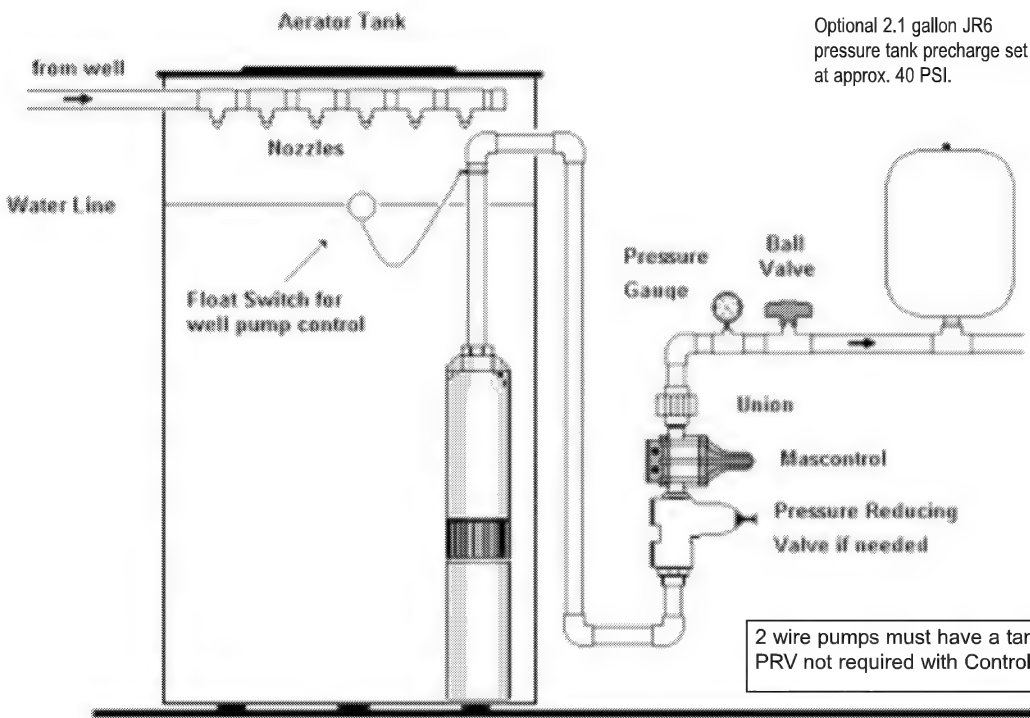
PRV not required with Controlpres.

Mascontrol Installation with Aerator Tank

Surface Pump Application



Submersible Pump Application



Controlpres

Constant Pressure - Constant Flow

Controlpres, a newer version of the Mascontrol valve, has all of the same innovative features as the original plus a built-in pressure-reducing valve, allowing for downstream pressure adjustments according to system requirements.

Item #79992 - Controlpres, 1-1/4" NPT
• 2 year warranty



Pressure gauge, 1/4"
FNPT is sold separately

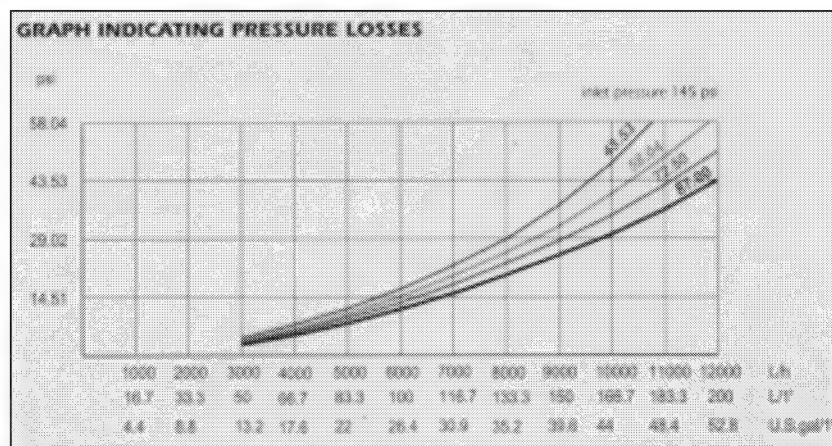


Features of Operation & Construction

- Provides for an adjustable down stream pressure between 36 psi to 100 psi
- Eliminates the need for a pressure tank and switch
- Unit maintains constant pressure, constant flow
- Built-in check vale
- Run-dry sensor for pump protection
- Dual voltage 115/230 with additional voltage requirements accommodated by the use of a contactor
- Time and space are saved by simple installation requirements and the unit's compact size
- Can be utilized on virtually all pumps

Technical Specifications

Dual voltage.....115V/230V
Acceptable power fluctuations.....+10%
Frequency50/60 Hz
Amp rating115V-16 FLA/230V-20 FLA
Use contractor for higher amp rating
Electronic enclosureNEMA 12
Maximum inlet pressure.....145 psi
Factory pressure setting.....43.5 psi
Pressure adjusting range.....36.2 psi, 101.5 psi
Male threaded connection1-1/4" NPT
Pressure gauge male threaded connection.....1/4" NPT





Jet-Rite 2 Well Tanks

Jet-Rite 2 tanks are ideally suited for irrigation applications, booster systems, shallow jet pumps and centrifugal pump configurations. The Jet-Rite 2 series is constructed with a single butyl diaphragm and polypropylene liner assembly that completely contains drawdown water. The diaphragm is constructed with an FDA approved, high-grade butyl rubber compound. Jet-Rite 2 tanks are made with a stainless steel system connection, are available in vertical and horizontal models and are finished with an appliance quality paint especially suited for outdoor installations.

Jet-Rite 2 tanks are quality tested at several stages on the production line to ensure the structural integrity of every tank.

All of Flexcon's quality tanks are backed by a five year written limited warranty.



Features:

- Stainless Steel Water Connection
- Virgin Polypropylene Liner
- 100% Butyl Diaphragm
- Appliance Quality Paint Finish
- Brass Air Stem
- Comprehensive Testing

Model PJR In-Line Tanks - Quick Sizing Drawdown in Gallons/Liters - Maximum Working Pressure 125 PSI

| Item # | Model | Total Tank Volume (Gal/Liters) | @ 20/40 PSI (Gal/Liters) | @ 30/50 PSI (Gal/Liters) | @ 40/60 PSI (Gal/Liters) | Dimensions | | System Connection | PSI Precharge | Shipping Weight (Lbs) |
|--------|--------|--------------------------------|--------------------------|--------------------------|--------------------------|-------------------|-----------------|-------------------|---------------|-----------------------|
| | | | | | | Diameter (inches) | Height (inches) | | | |
| 33285 | PJR-6 | 2.1/8 | 0.8/2.9 | 0.7/2.5 | 0.6/2.1 | 8 | 12 | 3/4" | 28 | 5 |
| 33286 | PJR-15 | 4.8/18 | 1.7/6.6 | 1.5/5.6 | 1.3/4.8 | 11 | 14.5 | 3/4" | 28 | 10 |
| 33287 | PJR-25 | 8.5/32 | 3.1/11.7 | 2.6/9.8 | 2.3/8.7 | 12.5 | 20 | 3/4" | 28 | 13 |

Model PJR Horizontal Tanks - Quick Sizing Drawdown in Gallons/Liters - Maximum Working Pressure 125 PSI

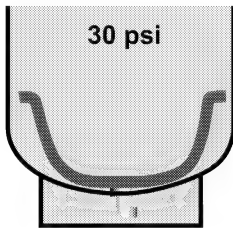
| Item # | Model | Total Tank Volume (Gal/Liters) | @ 20/40 PSI (Gal/Liters) | @ 30/50 PSI (Gal/Liters) | @ 40/60 PSI (Gal/Liters) | Dimensions | | System Connection | PSI Precharge | Shipping Weight (Lbs) |
|--------|------------|--------------------------------|--------------------------|--------------------------|--------------------------|-------------------|-----------------|-------------------|---------------|-----------------------|
| | | | | | | Diameter (inches) | Height (inches) | | | |
| 33283 | PJR-20 (S) | 5.3/20 | 1.9/7.3 | 1.6/6.2 | 1.4/5.4 | 11.4 | 17.5 | 3/4" | 28 | 13.3 |
| 33288 | PJR-25 (S) | 8.5/32 | 3.1/11.7 | 2.6/9.8 | 2.3/8.7 | 12.5 | 20.0 | 3/4" | 28 | 15 |
| 33289 | PJR-44 (S) | 14/53 | 5.1/19.3 | 4.3/16.4 | 3.8/14.2 | 16.3 | 20.8 | 3/4" | 28 | 28.3 |
| 33305 | PJR-66 (S) | 20/80 | 7.6/28.8 | 6.5/24.8 | 5.5/20.8 | 16.3 | 28.5 | 1" | 28 | 38.0 |

Maximum working temperature for all Well Tanks listed on the page is 140°F (60°C).

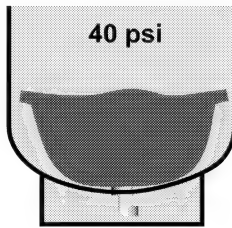


Common Items for Aqua Flo, Well-Rite Online[®], Well-Rite and Jet-Rite 2 Well Tanks

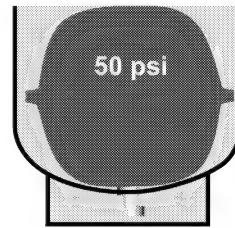
Controlled Action Diaphragm ("CAD") Operation - 30/50 psi pressure range



1 Pump comes on and begins to fill the tank.



2 Pump continues to run compressing air charge in tank.



3 Pump shuts down when cutout pressure is reached. Drawdown is available on demand.

Pump Stands

Item #33301

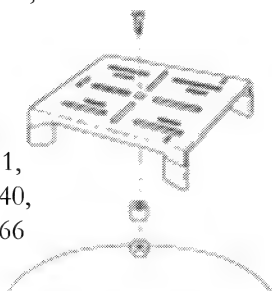
Model #PS1621 Fits:

Tank Models 44, 45, 60, 66, 80, 88, 120, 122

Item #33300

Model #PS2126 Fits:

Tank Models 100, 111, 140, 144, 200, 211, 240, 244, 260, 266, 360, 366



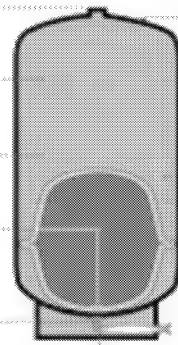
Threaded nut for easy installation of pump stand

Clean, air tight welds are achieved using the most modern welding equipment available

Comprehensive pre-charged air cushion design reduces condensation and regulates diaphragm action

Stainless steel port diffuser directs water flow upward & outward while locking lower diaphragm in place

True air flow design means fewer problems with condensation



Adjustable aircharge

Two part urethane finish over epoxy primer coat combines durability and high luster

Diaphragm of FDA approved, high grade butyl

Positive lock, internal clench ring. Cannot slip...does not rely on tank wall.

Online[®] Union Connection

Welded stainless steel connection

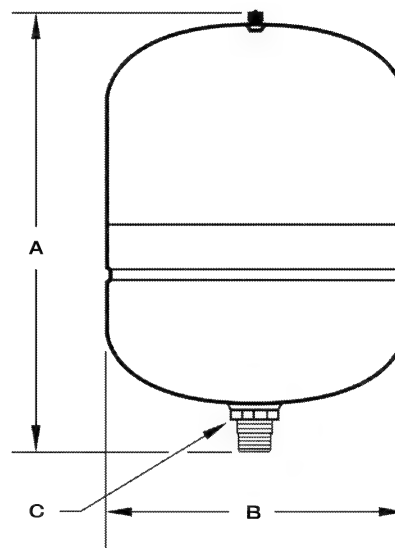
Well Tanks Replacement Guide

| Aqua Flo | Well-Rite | Well-Rite Online | H2 Pro | Well-X Trol | Well-Flow | Champion | How 2 Tank | Goulds A.O. Smith | State Perma Tank | Well Mate | Pro-Sputce | Standard Galvanized |
|----------|-----------|------------------|---------|-------------|-----------|----------|------------|-------------------|------------------|-----------|------------|---------------------|
| PJR6 | PJR6 | PJR6 | N/A | WX-101 | WF6 | CM1001 | HT2 | V6P | PIL-2 | WM8L | N/A | 5 GAL. |
| PJR15 | PJR15 | PJR15 | N/A | WX-102 | WF15 | CM1002 | HT4.4 | V15P | PIL-5 | WM18L | N/A | 12 GAL. |
| PJR20* | PJR20 | PJR20 | N/A | WX-105 | N/A | N/A | N/A | N/A | N/A | WM25L | PS15-502 | 18 GAL. |
| PJR25* | PJR25 | PJR25 | N/A | WX-103 | WF25 | CM1003 | HT8.6 | V25P | PIL-7 | N/A | N/A | 21 GAL. |
| AF44 | WR45 | WR45-OLC | WWT-14 | WX-201 | WF45 | CM3001 | HT14 | V45 | PAD-14 | WM4 | PS30-T01 | 30 GAL. |
| AF66 | WR60 | WR60-OLC | WWT-20 | WX-202 | WF60 | CM4202 | HT20 | V60 | PAD-20 | WM6 | PS42T-T02 | 42 GAL. |
| AF88 | WR80 | WR80-OLC | WWT-25 | WX-202XL | N/A | N/A | N/A | V80 | N/A | N/A | N/A | 82 GAL. |
| AF111 | WR100 | WR100-OLC | WWT-30 | WX-205 | WF110 | CM8205 | N/A | N/A | N/A | N/A | PS75T-T03 | 82 GAL. |
| AF122 | WR120 | WR120-OLC | WWT-35 | WX-203 | WF100 | CM8003 | HT32 | V100 | PAD-36 | WM9 | PS82T-T05 | 82 GAL. |
| AF144 | WR140 | WR140-OLC | WWT-45 | WX-250 | WF140 | CM10050 | HT44 | V140 | PAD-52 | WM14 | PS120-T50 | 120 GAL. |
| AF211 | WR200 | WR200-OLC | WWT-65 | WX-251 | WF200 | CM12051 | HT44 | V200 | PAD-52 | WM20 | PS200-T51 | 220 GAL. |
| AF244 | WR240 | WR240-OLC | WWT-80 | WX-255 | N/A | N/A | N/A | V250 | N/A | N/A | N/A | 220 GAL. |
| AF266 | WR260 | WR260-OLC | WWT-85 | WX-302 | WF260 | CM17002 | HT86 | V260 | PAD-86 | WM25 | PS220-T52 | 220 GAL. |
| AF366 | WR360 | WR350-OLC | WWT-120 | WX-350 | WF360 | CM22050 | HT119 | V350 | PAD-119 | WM35 | N/A | 315 GAL. |



MATERIALS OF CONSTRUCTION

- **Tank:** 16 gauge cold rolled steel
- **Finish:** Appliance quality paint for indoor or outdoor installation
- **Water chambers:** 100% butyl rubber, virgin polypropylene liner
- **Connection:** Stainless Steel
- **Testing:** High pressure, seam weld, helium, final precharge check
- **Air valve:** Brass valve with o-ring seal
- **Warranty:** Five year



DIMENSIONS & CAPACITIES - INLINE MODELS

| Model | Total Tank Volume | | A Height / Length | | B Diameter | | C Connection | Total Weight | |
|----------|-------------------|--------|----------------------|------|---------------|------|-----------------|--------------|-------|
| | gal | liters | in | cm | in | cm | | lbs | kilos |
| PJR 6 | 2.1 | 8 | 12.0 | 30.0 | 8.0 | 20.0 | .75" NPT | 5.0 | 2.3 |
| PJR 15 | 4.8 | 18 | 14.5 | 37.0 | 11.0 | 28.0 | .75" NPT | 10.0 | 4.6 |
| PJR 25 | 9.0 | 32 | 18.9 | 48.1 | 12.5 | 31.8 | .75" NPT | 15.4 | 7.0 |
| PJR 44IL | 14.0 | 53 | 19.75 | 50.0 | 15.3 | 39.0 | 1" NPT | 23.3 | 10.6 |

DIMENSIONS & CAPACITIES - HORIZONTAL MODELS

| | | | | | | | | | |
|---------|------|----|------|------|------|------|----------|------|------|
| PJR 20S | 5.3 | 20 | 17.5 | 44.4 | 11.4 | 28.9 | .75" NPT | 13.3 | 6.0 |
| PJR 25S | 8.5 | 32 | 18.9 | 48.1 | 12.5 | 31.8 | .75" NPT | 15.4 | 7.0 |
| PJR 44S | 14.0 | 53 | 20.8 | 52.8 | 16.3 | 41.4 | .75" NPT | 27.0 | 12.3 |
| PJR 66S | 20.0 | 80 | 28.5 | 72.4 | 16.3 | 41.4 | 1" NPT | 38.0 | 17.2 |

Maximum working pressure 125 psig. Maximum working temperature, internal & external 140° F. Tank pre-charge 20 psig.

QUICK SIZING CHART

| Model | Total Tank Volume | | Total Drawdown* | | | | | |
|------------|-------------------|--------|-----------------|--------|-------|--------|-------|--------|
| | gal | liters | 20/40 | | 30/50 | | 40/60 | |
| | | | gal | liters | gal | liters | gal | liters |
| PJR 6 | 2.1 | 8 | 0.8 | 2.9 | 0.7 | 2.5 | 0.6 | 2.1 |
| PJR 15 | 4.8 | 18 | 1.7 | 6.6 | 1.5 | 5.6 | 1.3 | 4.8 |
| PJR 20S | 5.3 | 20 | 1.9 | 7.3 | 1.6 | 6.2 | 1.4 | 5.4 |
| PJR 25 (S) | 9.0 | 32 | 3.1 | 11.7 | 2.6 | 9.8 | 2.3 | 8.7 |
| PJR 44 (S) | 14.0 | 53 | 5.1 | 19.3 | 4.3 | 16.4 | 3.8 | 14.2 |
| PJR 60S | 20.0 | 80 | 7.6 | 28.8 | 6.5 | 24.8 | 5.5 | 20.8 |
| PJR 44IL | 14.0 | 53 | 5.1 | 19.3 | 4.3 | 16.4 | 3.8 | 14.2 |

*Total drawdown assumes tank pre-charge set at 2 psi below cut-in pressure. Drawdown can be affected by many factors, including temperature, pressure, and elevation.

> www.flexconind.com
 > 781-886-2424
 > 300 Pond Street
 > Randolph, MA 02368

FLEXCON
INDUSTRIES
 The Reliable Source®

IT'S LITTLE, BUT IT PACKS A BIG PUNCH.

[JET RITE BOOSTER TANK WITH STAINLESS STEEL NIPPLES]

16 gauge solid steel tank finished with highest quality powder coat finish.

Condensation reducing design virtually eliminates external corrosion.

Stainless Steel Nipples designed to stand up to the harshest elements.

Deep drawn domes for strength.

Steel clench ring regulates movement and prevents diaphragm from rubbing against tank wall.



Jet Rite 2 tanks are ideally suited for irrigation applications, booster systems, shallow jet pumps and centrifugal pump configurations. The Jet Rite 2 series is constructed with a single FDA approved 100% butyl diaphragm and a polypropylene liner assembly that completely contains drawdown water keeping it as pure as possible.

In addition to their bullet proof design, Jet Rite 2 tanks are made with a stainless steel system connection. And, they are finished with appliance quality paint to help them withstand even the harshest outdoor elements. They are also available in both vertical and horizontal models providing unlimited installation flexibility.

If your looking for the highest quality booster tank, look no further, Jet Rite 2 will give you all the oomph you need and more.



FLEXCON INDUSTRIES
The Reliable Source®

Novaclean Automatic Water Filters

Operation Manual

ACF Activated Carbon Filter, MMF Multimedia Filter, NF Neutralizing Filter

*Page 5 of this manual contains important maintenance procedures required for the continued proper operation of this unit. These **MUST** be performed regularly for your guarantee to remain valid.*

NOVATEK

51876 Rev. 11/08

Novaclean ACF - Specifications

| Model Description | Carbon Cu Ft | Flow Rates USGPM | | | Installation Space Inches - W x D x H | Fiberglass Tank Size - Inches | Shipping Weight - Lbs |
|-------------------|--------------|------------------|------|----------|---------------------------------------|-------------------------------|-----------------------|
| | | Service | Peak | Backwash | | | |
| NACF75 | .75 | 4 | 5 | 3.5 | 10 x 10 x 57 | 8 x 47 | 45 |
| NACF10 | 1.0 | 5 | 7 | 5 | 12 x 12 x 57 | 10 x 47 | 65 |
| NACF15 | 1.5 | 7 | 10 | 7 | 14 x 14 x 62 | 12 x 52 | 93 |
| NACF20 | 2.0 | 10 | 12 | 10 | 16 x 16 x 60 | 14 x 50 | 105 |

Novaclean MMF - Specifications

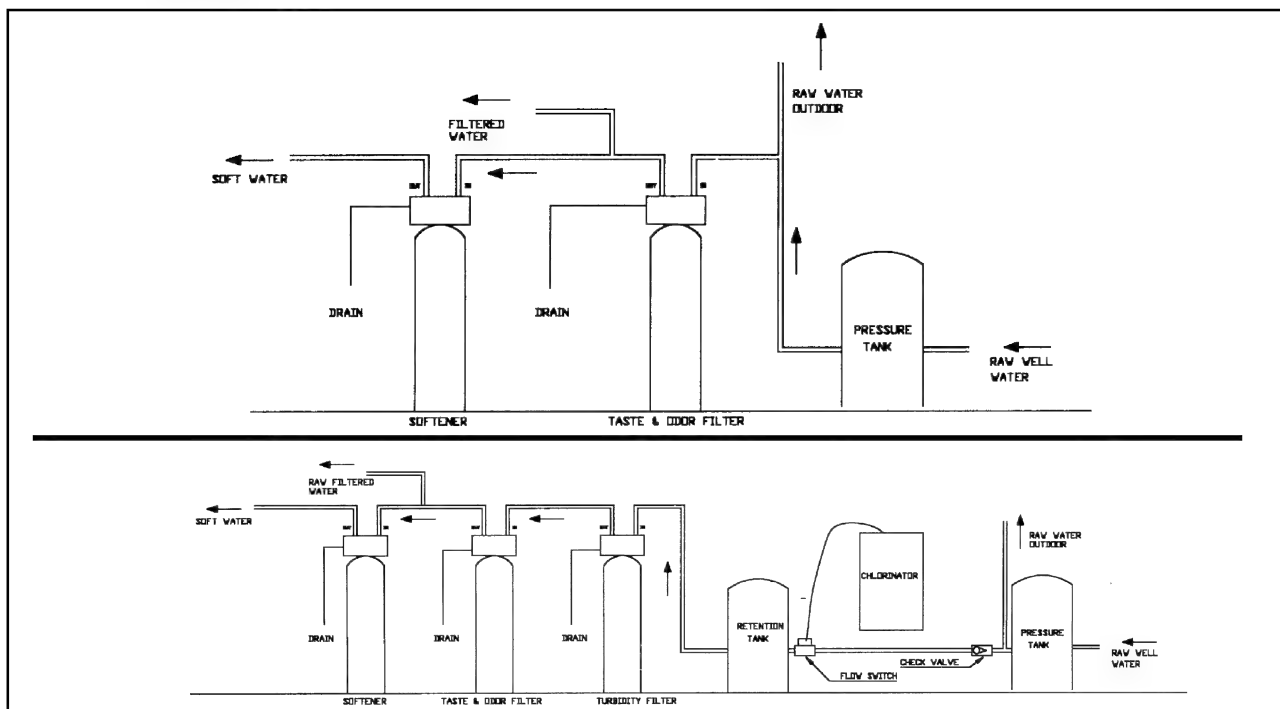
| Model Description | Media Cu Ft | Flow Rates USGPM | | | Installation Space Inches - W x D x H | Fiberglass Tank Size - Inches | Shipping Weight - Lbs |
|-------------------|-------------|------------------|------|----------|---------------------------------------|-------------------------------|-----------------------|
| | | Service | Peak | Backwash | | | |
| NMMF75 | .75 | 4 | 5 | 4 | 10 x 10 x 57 | 8 x 47 | 95 |
| NMMF10 | 1.0 | 5 | 7 | 5 | 11 x 11 x 58 | 9 x 48 | 145 |
| NMMF15 | 1.5 | 7 | 10 | 7 | 12 x 12 x 64 | 10 x 54 | 213 |
| NMMF20 | 2.0 | 10 | 12 | 10 | 14 x 14 x 62 | 12 x 52 | 265 |

Novaclean NF - Specifications

| Model Description | Media Cu Ft | Flow Rates USGPM | | | Installation Space Inches - W x D x H | Fiberglass Tank Size - Inches | Shipping Weight - Lbs |
|-------------------|-------------|------------------|------|----------|---------------------------------------|-------------------------------|-----------------------|
| | | Service | Peak | Backwash | | | |
| NNF75 | .75 | 2 | 3.5 | 3.5 | 10 x 10 x 57 | 8 x 47 | 75 |
| NNF10 | 1.0 | 3 | 5 | 4 | 11 x 11 x 58 | 9 x 48 | 115 |
| NNF15 | 1.5 | 5 | 8 | 5 | 12 x 12 x 64 | 10 x 54 | 165 |
| NNF20 | 2.0 | 6 | 10 | 7 | 14 x 14 x 62 | 12 x 52 | 215 |

- Peak flow rates intended for intermittent use only (10 minutes or less) and are for residential applications only. Do not use peak flow rates for commercial applications.
- At the stated flow rates, the pressure drop through these devices will not exceed 15 psig.
- For satisfactory operation, the pumping rate of the well system must equal or exceed indicated backwash flow rate.
- Maximum Water Temperature = 110°F (43°C)
- Maximum Operating Pressure = 100 PSIG (689 kPa)
- Pipe Size = 3/4"
- Voltage = 110V Standard
- The manufacturer reserves the right to make product improvements which may deviate from the specifications and descriptions stated herein, without obligation to change previously manufactured products or to note the change.

Typical Installations



NOTE: A neutralizing filter is the first unit installed in a water system after the outdoor raw water lines (*) when pH correction is required.

Installation and Start-up Procedure

Installation Instructions

CAUTION:

If the ground from the electrical panel or breaker box to the water meter or underground copper pipe is tied to the copper water lines and these lines are cut during installation of the Noryl bypass valve and/or poly pipe, an approved grounding strap must be used between the two lines that have been cut in order to maintain continuity. The length of the grounding strap will depend upon the number of units being installed and/or the amount of copper pipe being replaced with poly. See Figure 1.

In all cases where metal pipe was originally used and is later interrupted by poly pipe or the Noryl bypass valve, as in Figure 1 or by physical separation as in Figure 2, to maintain proper metallic pipe bonding, an approved ground clamp c/w not less than #6 copper conductor must be used for continuity.

Check your local electrical code for the correct clamp and cable size.

NOTE: This timer's programs will be out of sync if you turn the knob too far or do not allow the drive motor to stop completely before continuing to the next step. If this happens while doing any procedure, rotate the knob clockwise until the white dot lines up with the time of day arrow and the unit will return to the service position. You can then start again.

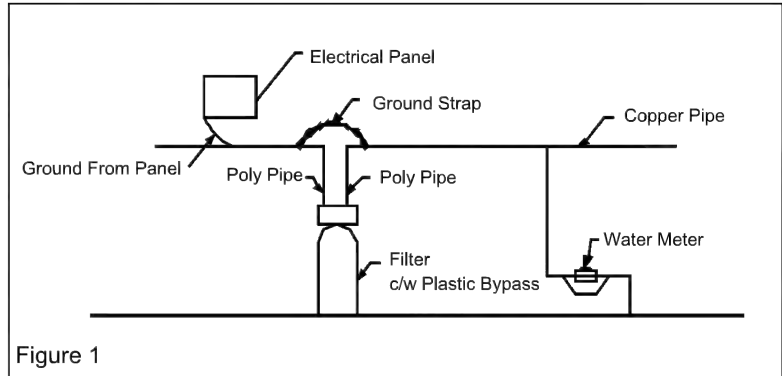


Figure 1

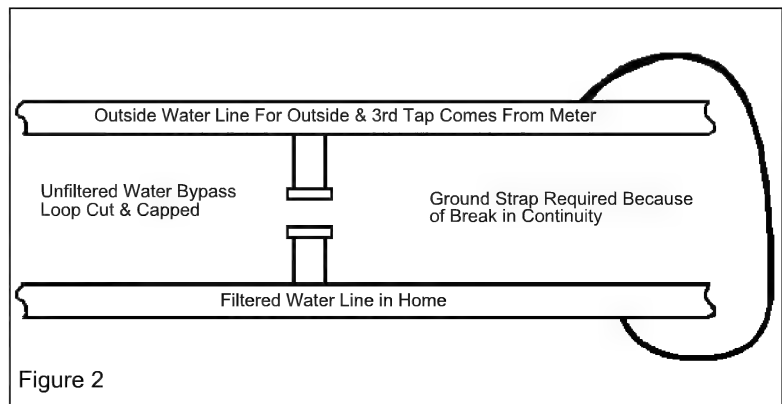


Figure 2

1. Place filter on a flat surface in desired location, near a drain and 115 volt AC outlet. Subjecting your filter to freezing or to water temperatures above 120°F (49°C) will void the warranty. Remove the valve from the carton. Be sure the distributor tube is in place. Carefully position the valve over it and turn securely on to the fiberglass tank.

Note: All multi media and some larger units are supplied with the media separate. Please refer to page 5 Installations & Replacement of Filter Media Pak.

2. Attach the installation kit or bypass to the control valve. Make inlet and outlet water connections to meet applicable plumbing codes. A 3/4" inlet line is recommended. When sweat fittings are used, solder the adapters for the inlet and outlet to the copper pipe first. This procedure is necessary because the controls **must not** be subjected to temperatures above 160°F (71°C). Then, using teflon tape, screw the adapters for the inlet, outlet and drain into the valve. CAUTION: do not use pipe thread compound as it may attack the materials in the valve body.
3. On the drain, use 1/2" hose barb supplied and full 1/2" hose (not supplied) for the drain line and make the shortest run to a suitable drain. The drain line must be secured in position at the end which discharges into the drain so it cannot be inadvertently moved from the drain.
4. Loosen the two screws on the timer cover to remove it from the timer.
5. Automatic water filters are supplied from the factory in the backwash position, ready for start up. Turn on the water supply to the unit. Open the supply line slowly and allow the air to escape from the filter before turning the supply water on all the way. Allow the unit to backwash until all the air and media fines are no longer showing at the drain. This may take up to 15 minutes so you need to unplug the timer until you are ready to continue.
6. Plug the timer in, set the time and frequency of regeneration following instruction on page 4. Allow the unit to complete the cycle on its own from this point.
7. Make sure the bypass valve is in the service position.

ALL GOVERNMENT CODES GOVERNING INSTALLATIONS OF THESE DEVICES MUST BE OBSERVED.

Operating Instructions

How Your Automatic Filter Works

Raw water enters your home through the main supply line, enters your filter, and passes downward through the media bed. Impurities such as turbidity and sediment (MMF) and organics (ACF) are removed from the water. The filtered water then flows up and into your household water lines.

The neutralizing filter (NF) is designed to raise the pH of your water to eliminate corrosive characteristics.

EXAMPLE: A pH of 5.5 can be raised to 7.0 which is neutral. When the water is neutralized it is then possible to remove the iron with the addition of an iron filter.

Water Pressure

Your water filter is designed to operate under normal water pressures from 20 psi to 125 psi.

Regeneration and Automatic Bypass

Water filters are factory set to regenerate at 1:00 a.m. during a period of little or no water use. The regeneration cycle lasts approximately 15 minutes, after which filtered water service is restored. While regeneration is taking place, "raw water" automatically bypasses the filter if required. If possible, avoid using water during regeneration to prevent unfiltered water entering your household plumbing system. Note: When more than one filter is being used, regeneration should be staggered by 15 minute intervals from 1 a.m.

Manual Bypass (Figure 3A)

In case of an emergency, you can isolate your water filter from the water supply using the bypass valve located at the back of the control.

In normal operation the bypass is open with the on/off knobs in line with the inlet and outlet pipes. To isolate the filter, simply rotate the knobs clockwise (as indicated by the word BYPASS and arrow) until they lock.

You can use your water related fixtures and appliances as the water supply is bypassing the filter. However, the water you use will be unfiltered.

Stainless Steel Bypass (Figure 3B)

In normal operation the bypass lever is aligned with the inlet/outlet with the pointer on SERVICE. To isolate the filter, rotate lever counter clockwise until it stops and pointer indicates unit is in bypass.

You can use your water related fixtures and appliances as the water supply is bypassing the filter. However, the water you use will be unfiltered.

To resume filtered water service, open the bypass valve by reversing the rotation of the lever.

New Sounds

You will notice new sounds, such as the hum of the timer, as your filter operates. During regeneration, it will not be uncommon to hear water running to the drain.

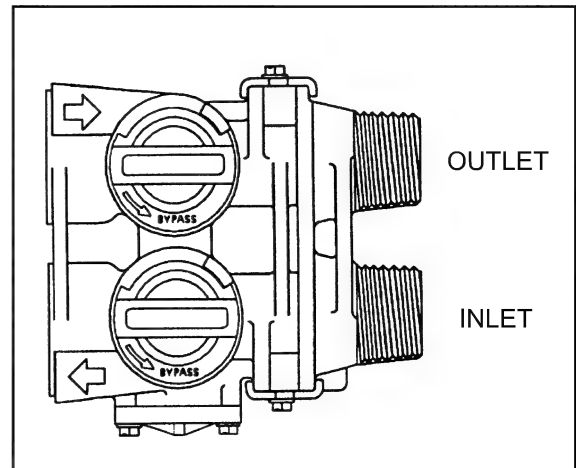


Figure 3A

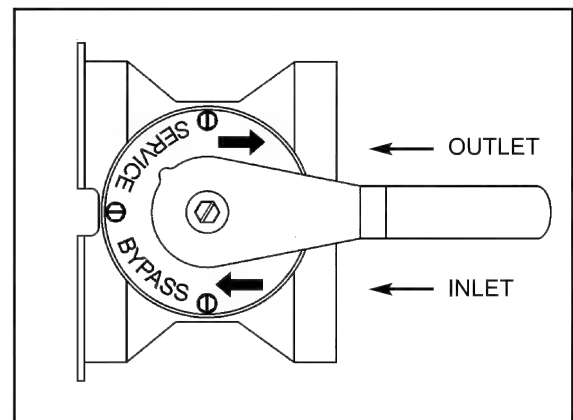


Figure 3B

Programming Backwash Controls

Setting The 24-Hour Timer

Press and hold the red button in to disengage the drive gear. Turn the large dial until the actual time of day is opposite the time of day pointer. Release the red button to re-engage the drive gear.

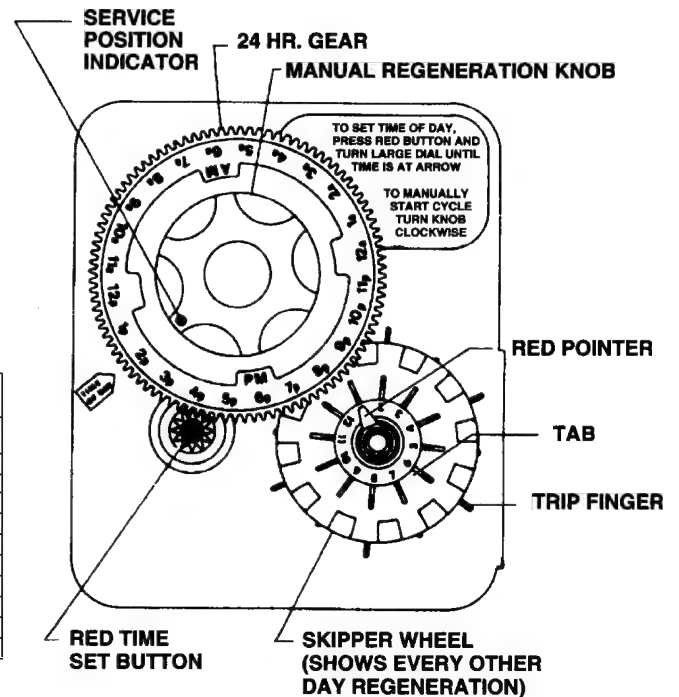
Determining The Backwash Frequency

The following table can be used to help determine the frequency of regeneration. Use this table as a guide – individual circumstances will require more or less frequent regenerations.

To set a neutralizing filter follow the table under mild conditions.

NOTE: Add one person if you have a dishwasher.

| MMF FILTERS | SEDIMENT TURBIDITY | MILD | AVERAGE | EXTREME |
|---|--------------------|------|---------|---------|
| ACF FILTERS | TASTE ODOR | MILD | AVERAGE | EXTREME |
| No. of Persons | | | | |
| Calendar Clock Regeneration Frequency - No. of Tabs Pushed Outwards | | | | |
| 2 | 1 | 1 | 1 | 1 |
| 3 | 1 | 1 | 2 | 2 |
| 4 | 1 | 2 | 2 | 3 |
| 5 | 2 | 2 | 3 | 3 |
| 6 | 2 | 2 | 3 | 3 |
| 7 | 2 | 3 | 3 | 4 |
| 8 | 2 | 3 | 3 | 4 |
| 9 | 3 | 3 | 4 | 4 |
| 10 | 3 | 4 | 4 | 6 |



Setting The Backwash Frequency

The filter control features a skipper wheel with twelve numbered tabs and trip fingers. Each represents one day of a twelve day schedule. By adjusting the skipper wheel tabs, the control can be programmed to backwash every second, third, fourth, sixth or twelfth day, according to your requirements.

The control is shipped with all the skipper wheel tabs pushed outwards. You must push the tabs in toward the center of the wheel (retracting the trip finger) for each day that backwashing is not required.

Rotate the skipper wheel until number "1" is at the pointer, leave this tab out. Moving clockwise round the skipper wheel adjust the remaining tabs using the following table as a guide.

| No. of backwashes required in 12 days | Skipper Wheel Tab Settings | | | | | | | | | | | |
|---------------------------------------|----------------------------|----|-----|-----|-----|----|-----|----|-----|-----|-----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1 | Out | In | In | In | In | In | In | In | In | In | In | In |
| 2 | Out | In | In | In | In | In | In | In | In | In | In | In |
| 3 | Out | In | In | In | Out | In | In | In | Out | In | In | In |
| 4 | Out | In | In | Out | In | In | Out | In | In | Out | In | In |
| 6 | Out | In | Out | In | Out | In | Out | In | Out | In | Out | In |

Manual Regeneration

Turn the manual regeneration knob clockwise. This slight movement of the manual regeneration knob engages the program wheel and starts the regeneration process. The back center knob will make one revolution in approximately three hours and stop in the position shown in the drawing. Actual backwash time is 14 minutes. In any event, treated water may be drawn after rinse water stops flowing from the filter's drain line.

Maintenance Instructions

Maintenance of your new water filter requires very little time or effort but it is essential. Regular maintenance will ensure many years of efficient and trouble free operation.

Care of All Water Filters

To retain the attractive appearance of your new water filter, clean occasionally with a mild soap solution. Do not use abrasive cleaners, ammonia or solvents. Never subject your filter to freezing or to water temperatures above 120°F.

Replacing Media Bed

NF - the media bed in a neutralizing filter is slowly dissolved and has to be replaced. The frequency of replacement varies, depending on water quality – consult your dealer to determine the expected life of your media bed.

ACF - under normal operating conditions the effective life of the filter media is approximately one to three years depending on the water quality, after which, taste and odor problems may return. When this happens contact your dealer for a replacement media bed.

MMF - under normal operating conditions, the media should never need to be replaced. If you experience pressure loss and cannot correct it with a manual regeneration, your media bed may need replacing – contact your dealer.

Installation & Replacement of Filter Media Pak

Check to ensure all media parts are received.

The first step in replacing the media bed is to shut off the water supply to the filter. Then place the unit into the backwash position to release any pressure in the lines. At this point, you must disconnect the plumbing from the inlet and outlet. Then unscrew the control valve (Item A) from the fiberglass tank. Once this has been done, remove the distributor tube (Item B). Then you can remove the filter media and two types of gravel from the tank. The quickest way to do this is by simply tipping the tank upside down into a large drum or pail. The tank must be rinsed out completely and have no media or gravel left in it at all.

Loading the Media-Pak

Place the distributor tube (Item B) back down the center of the tank. The top of this tube should be plugged with a rag or cork to prevent media from entering. Pour the bag of coarse gravel (Item E) into the tank, then pour the bag of fine gravel (Item D) into the tank.

It is important that the distributor tube is not moved or pulled out as it would not be possible to put it down to the bottom of the tank once gravel or media are in the tank.

Finally pour the larger bag(s) of media into the tank.

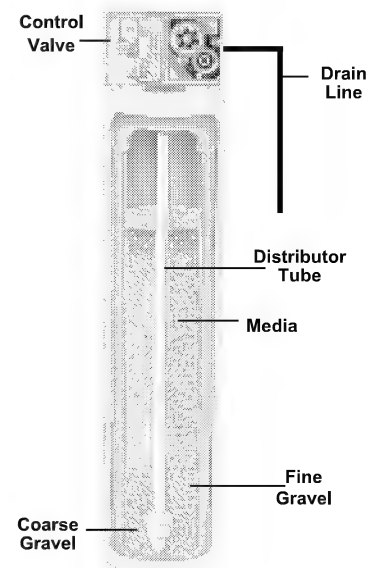
For multi-media units only. These units have to be loaded in the following order:

1. Coarse gravel (1/2 x 1/4)
2. Fine gravel (1/8 x 1/16)
3. Coarse garnet (8 x 12)
4. Fine garnet (30 x 40)
5. Fine filter sand (.45 x .55)
6. Anthrafilt

Once this is done, the rag or cork should be removed from the distributor tube. Clean off the top of the tank. Finally place the control valve on the tank and onto the distributor tube. Tighten the control valve onto the tank. Connect or reconnect the inlet and outlets and drain. The control valve should be in the backwash position. Slowly open the inlet valve water supply and slowly fill the filter tank until water appears at the open drain line (Item F). Return the control to the service position and shut the inlet off for approximately one hour to allow the media to soak in the water.

After one hour, turn inlet water on slowly and place the control into the backwash position and plug the unit's electrical cord into a constant power source. Let the unit continue through its regeneration cycle automatically.

The regeneration is necessary so all media fines are backwashed down the drain to ensure clean filtered water. After this media has been replaced, it may be necessary to reset the present time of day on the control valve timer as it will have been unplugged for some time.



Trouble Shooting Guide

| PROBLEM | CAUSE | CORRECTION |
|---|---|--|
| 1. Filter bleeds taste and odor or sediment | Bypass valve is open Electrical service to unit has been interrupted Defective or stripped media bed Quality of water has worsened Filter capacity too small Filter not backwashing enough Excessive water usage Tabs on skipper wheel not out | Close bypass valve. Assure permanent electrical service (check fuse, plug or switch). Replace media. Have water sample analyzed to determine any change. Replace with larger unit or add another filter. Be sure control is not clogged or drain line restricted. Be sure water pressure has not dropped and that pump has sufficient capacity. Increase frequency of regeneration. Make sure there are no leaks in toilets or sinks. Push as many tabs to the outside of the skipper wheel as necessary to provide adequate frequency of regeneration. |
| 2. Filter fails to regenerate | Electrical service to unit has been interrupted Timer is defective Power failure Broken cogs on the 24 hour gear Timer motor does not run | Assure permanent electrical service (check fuse, plug or switch). Replace timer. Reset time of day. Replace 24 hour gear. Replace defective motor. |
| 3. Filter regenerates every day | Faulty gear train | Check the mechanical linkage on the timer control to eliminate possible binding in the gear train. |
| 4. Loss of water pressure | Iron or turbidity build-up in filter Filter not regenerating often enough Not enough water volume or pressure to backwash properly | Clean control and treat bed with Pro-Rust Out. Increase frequency of regeneration. Increase frequency of regeneration. Correct water supply problem. |
| 5. Loss of media through drain line | Air in water system Backwash rate too fast | Assure that well system has proper air eliminator control. Check for dry well condition. Check drain flow control for proper flow rate. |
| 6. Drain flows continuously | Foreign material in control Timer motor stopped or jammed | Remove piston assembly and inspect bore, remove foreign material and check control in various regeneration positions. Replace timer motor. |

Guarantee

Novatek guarantees that your new water conditioner is built of quality material and workmanship. When properly installed and maintained, it will give years of trouble free service.

Seven Year Complete Parts Guarantee:

Novatek will replace any part which fails within 84 months from date of manufacture, as indicated by the serial number provided the failure is due to a defect in material or workmanship. The only exception shall be when proof of purchase or installation is provided and then the warranty period shall be from the date thereof.

Lifetime Guarantee on Mineral Tanks and Brine Tanks:

Novatek will provide a replacement mineral tank or brine tank to any original equipment purchaser in possession of a tank that fails within his/her lifetime, provided that the water conditioner is at all times operated in accordance with specifications and not subject to freezing.

General Provisions:

Novatek assumes no responsibility for consequential damage, labor or expense incurred as a result of a defect or for failure to meet the terms of these guarantees because of circumstances beyond its control.

NOVATEK



**Pentair
Water**

Fleck 2510 & 2510 Econominder

Service Manual

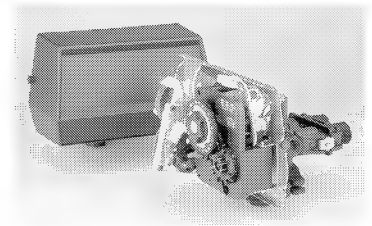


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JOB SPECIFICATION SHEET

Job Number: _____
 Model Number: _____
 Water Hardness: _____ ppm or gpg
 Capacity Per Unit: _____
 Mineral Tank Size: _____ Diameter: _____ Height: _____
 Salt Setting per Regeneration: _____

1. Type of Timer:

- A. 7 Day or 12 Day
- B. Meter Initiated

2. Downflow:

Upflow

Upflow Variable

3. Meter Size:

- A. 3/4" Std Range (125 - 2,100 gallon setting)
- B. 3/4" Ext Range (625 - 10,625 gallon setting)
- C. 1" Std Range (310 - 5,270 gallon setting)
- D. 1" Ext Range (1,150 - 26,350 gallon setting)
- E. 1-1/2" Std Range (625 - 10,625 gallon setting)
- F. 1-1/2" Ext Range (3,125 - 53,125 gallon setting)
- G. 2" Std Range (1,250 - 21,250 gallon setting)
- H. 2" Ext Range (6,250 - 106,250 gallon setting)
- I. 3" Std Range (3,750 - 63,750 gallon setting)
- J. 3" Ext Range (18,750 - 318,750 gallon setting)
- K. Electronic _____ Pulse Count _____ Meter Size _____

4. System Type:

- A. System #4: 1 Tank, 1 Meter, Immediate, or Delayed Regeneration
- B. System #4: Time Clock
- C. System #4: Twin Tank
- D. System #5: 2-5 Tanks, Interlock Mechanical
2-4 Tanks, Interlock Electronic
Meter per unit for Mechanical and Electronic
- E. System #6: 2-5 Tanks, 1 Meter, Series Regeneration, Mechanical
2-4 Tanks, 1 Meter, Series Regeneration, Electronic
- F. System #7: 2-5 Tanks, 1 Meter, Alternating Regeneration,
Mechanical
2 Tanks only, 1 Meter, Alternating Regeneration,
Electronic
- G. System #9: Electronic Only, 2-4 Tanks, Meter per Valve, Alternating
- H. System #14: Electronic Only, 2-4 Tanks, Meter per Valve. Brings
units on and offline based on flow.

5. Timer Program Settings:

- A. Backwash: _____ Minutes
- B. Brine and Slow Rinse: _____ Minutes
- C. Rapid Rinse: _____ Minutes
- D. Brine Tank Refill: _____ Minutes
- E. Pause Time: _____ Minutes
- F. Second Backwash: _____ Minutes

6. Drain Line Flow Control: _____ gpm

7. Brine Line Flow Controller: _____ gpm

8. Injector Size#: _____

9. Piston Type:

- A. Hard Water Bypass
- B. No Hard Water Bypass

INSTALLATION

Water Pressure

A minimum of 20 pounds (1.4 bar) of water pressure is required for regeneration valve to operate effectively.

Electrical Facilities

An uninterrupted alternating current (A/C) supply is required. Note: Other voltages are available. Please make sure your voltage supply is compatible with your unit before installation.

Existing Plumbing

Condition of existing plumbing should be free from lime and iron buildup. Piping that is built up heavily with lime and/or iron should be replaced. If piping is clogged with iron, a separate iron filter unit should be installed ahead of the water softener.

Location Of Softener And Drain

The softener should be located close to a drain to prevent air breaks and back flow.

BY-PASS VALVES

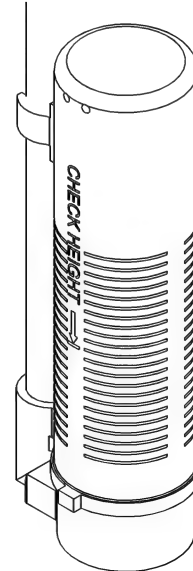
Always provide for the installation of a by-pass valve if unit is not equipped with one.

CAUTION Water pressure is not to exceed 125 psi (8.6 bar), water temperature is not to exceed 110°F (43°C), and the unit cannot be subjected to freezing conditions.

Installation Instructions

1. Place the softener tank where you want to install the unit making sure the unit is level and on a firm base.
2. During cold weather, the installer should warm the valve to room temperature before operating.
3. All plumbing should be done in accordance with local plumbing codes. The pipe size for residential drain line should be a minimum of 1/2" (13 mm). Backwash flow rates in excess of 7 gpm (26.5 Lpm) or length in excess of 20' (6 m) require 3/4" (19 mm) drain line. Commercial drain lines should be the same size as the drain line flow control.
4. Refer to the dimensional drawing for cutting height of the distributor tube. If there is no dimensional drawing, cut the distributor tube flush with the top of the tank.
5. Lubricate the distributor O-ring seal and tank O-ring seal. Place the main control valve on tank. Note: Only use silicone lubricant.
6. Solder joints near the drain must be done prior to connecting the Drain Line Flow Control fitting (DLFC). Leave at least 6" (15 cm) between the DLFC and solder joints when soldering pipes that are connected on the DLFC. Failure to do this could cause interior damage to the DLFC.
7. Teflon tape is the only sealant to be used on the drain fitting. The drain from twin tank units may be run through a common line.
8. Make sure that the floor is clean beneath the salt storage tank and that it is level.
9. Place approximately 1" (25 mm) of water above the grid plate. If a grid is not utilized, fill to the top of the air check (Figure 1) in the salt tank. Do not add salt to the brine tank at this time.
10. On units with a by-pass, place in by-pass position. Turn on the main water supply. Open a cold soft water tap nearby and let run a few minutes or until the system is free from foreign material (usually solder) that may have resulted from the installation. Once clean, close the water tap.

11. Slowly place the by-pass in service position and let water flow into the mineral tank. When water flow stops, slowly open a cold water tap nearby and let run until the air is purged from the unit.
12. Plug unit into an electrical outlet. Note: All electrical connections must be connected according to local codes. Be certain the outlet is uninterrupted.



60002 Rev E

Figure 1 Residential Air Check Valve

START-UP INSTRUCTIONS

The water softener should be installed with the inlet, outlet, and drain connections made in accordance with the manufacturer's recommendations, and to meet applicable plumbing codes.

1. Turn the manual regeneration knob slowly in a clockwise direction until the program micro switch lifts on top of the first set of pins. Allow the drive motor to move the piston to the first regeneration step and stop. Each time the program switch position changes, the valve will advance to the next regeneration step. Always allow the motor to stop before moving to the next set of pins or spaces.

NOTE: For electronic valves, please refer to the manual regeneration part of the timer operation section. If the valve came with a separate electronic timer service manual, refer to the timer operation section of the electronic timer service manual.

2. Position the valve to backwash. Ensure the drain line flow remains steady for 10 minutes or until the water runs clear (see above).
3. Position the valve to the brine / slow rinse position. Ensure the unit is drawing water from the brine tank (this step may need to be repeated).
4. Position the valve to the rapid rinse position. Check the drain line flow, and run for 5 minutes or until the water runs clear.
5. Position the valve to the start of the brine tank fill cycle. Ensure water goes into the brine tank at the desired rate. The brine valve drive cam will hold the valve in this position to fill the brine tank for the first regeneration.
6. Replace control box cover.
7. Put salt in the brine tank.

NOTE: Do not use granulated or rock salt.

3200 TIMER SETTING PROCEDURE

How To Set Days On Which Water Conditioner Is To Regenerate (Figure 2)

Rotate the skipper wheel until the number "1" is at the red pointer. Set the days that regeneration is to occur by sliding tabs on the skipper wheel outward to expose trip fingers. Each tab is one day. Finger at red pointer is tonight. Moving clockwise from the red pointer, extend or retract fingers to obtain the desired regeneration schedule.

How To Set The Time Of Day

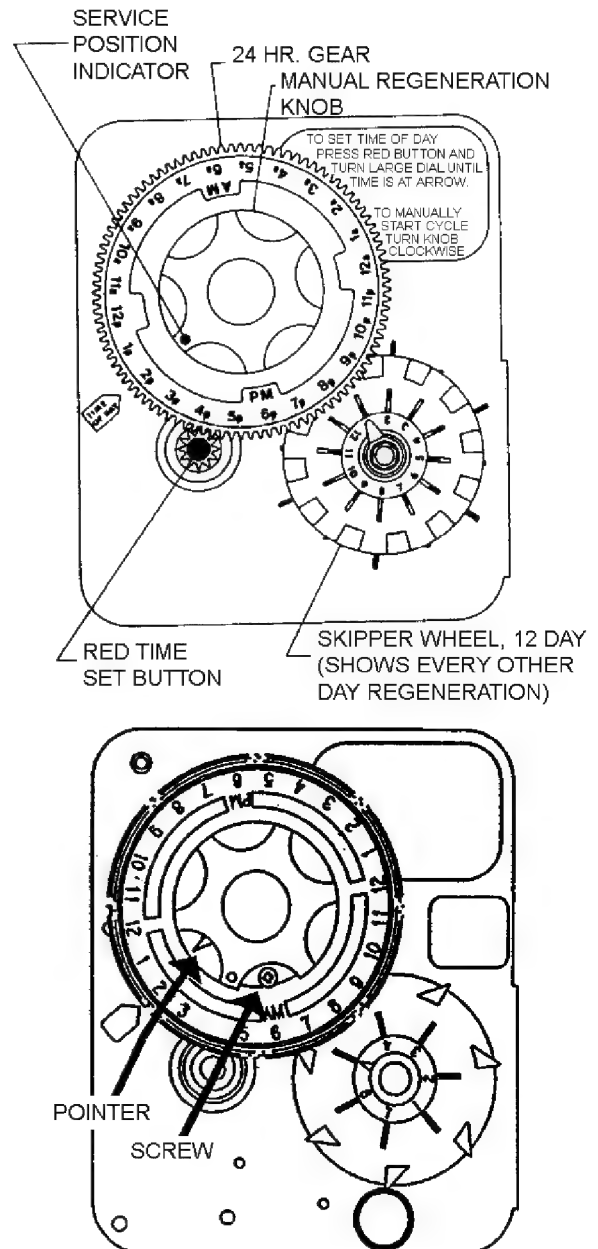
1. Press and hold the red button in to disengage the drive gear.
2. Turn the large gear until the actual time of day is at the time of day pointer.
3. Release the red button to again engage the drive gear.

How To Manually Regenerate Your Water Conditioner At Any Time

1. Turn the manual regeneration knob clockwise.
2. This slight movement of the manual regeneration knob engages the program wheel and starts the regeneration program.
3. The black center knob will make one revolution in the following approximately three hours and stop in the position shown in the drawing.
4. Even though it takes three hours for this center knob to complete one revolution, the regeneration cycle of your unit might be set for only one half of this time.
5. In any event, conditioned water may be drawn after rinse water stops flowing from the water conditioner drain line.

How to Adjust Regeneration Time

1. Disconnect the power source.
2. Locate the three screws behind the manual regeneration knob by pushing the red button in and rotating the 24 hour dial until each screw appears in the cut out portion of the manual regeneration knob.
3. Loosen each screw slightly to release the pressure on the time plate from the 24 hour gear.
4. Locate the regeneration time pointer on the inside of the 24 hour dial in the cut out.
5. Turn the time plate so the desired regeneration time aligns next to the raised arrow.
6. Push the red button in and rotate the 24 hour dial. Tighten each of the three screws.
7. Push the red button and locate the pointer one more time to ensure the desired regeneration time is correct.
8. Reset the time of day and restore power to the unit.



3200 ADJUSTABLE REGENERATION TIMER

IMPORTANT!
SALT LEVEL MUST ALWAYS BE ABOVE
WATER LEVEL IN BRINE TANK

61502-3200 Rev A

Figure 2

3210 TIMER SETTING PROCEDURE

Typical Programming Procedure

Calculate the gallon capacity of the system, subtract the necessary reserve requirement and set the gallons available opposite the small white dot on the program wheel gear (Figure 3).

NOTE: Drawing shows 8,750 gallon setting. The capacity (gallons) arrow (15) shows zero gallons remaining. The unit will regenerate tonight at the set regeneration time.

How To Set The Time Of Day

1. Press and hold the red button in to disengage the drive gear.
2. Turn the large gear until the actual time of day is opposite the time of day pointer.
3. Release the red button to again engage the drive gear.

How To Manually Regenerate Your Water Conditioner At Any Time

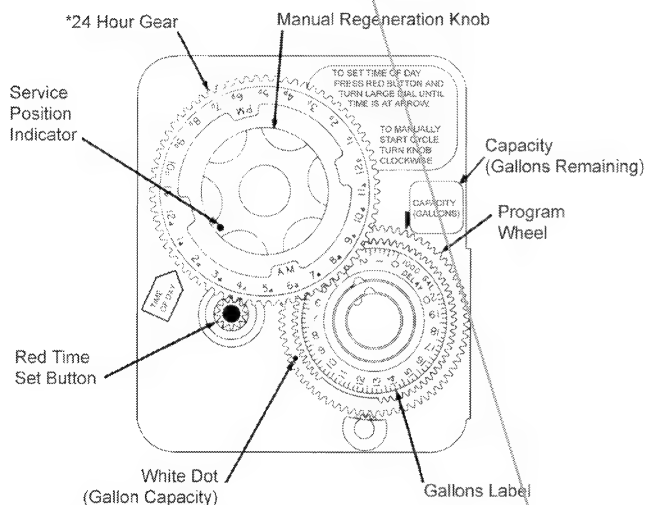
1. Turn the manual regeneration knob clockwise.
2. This slight movement of the manual regeneration knob engages the program wheel and starts the regeneration program.
3. The black center knob will make one revolution in the following approximately three hours and stop in the position shown in the drawing.
4. Even though it takes three hours for this center knob to complete one revolution, the regeneration cycle of your unit might be set for only one half of this time.
5. In any event, conditioned water may be drawn after rinse water stops flowing from the water conditioner drain line.

Immediate Regeneration Timers

These timers do not have a 24 hour gear. Setting the gallons on the program wheel and manual regeneration procedure are the same as previous instructions. The timer will regenerate as soon as the capacity gallons reaches zero.

NOTE: The program wheel to the left may be different than the program wheel on the product.

NOTE: To set meter capacity rotate manual knob one - 360° revolution to set gallonage.



*Immediate regeneration timers do not have a 24-hour gear. No time of day can be set.

61502-3200 Rev A

Figure 3

3200, 3210, 3220, 3230 REGENERATION CYCLE SETTING PROCEDURE

How To Set The Regeneration Cycle Program

The regeneration cycle program on your water conditioner has been factory preset, however, portions of the cycle or program may be lengthened or shortened in time to suit local conditions.

3200 Series Timers (Figure 4)

1. To expose cycle program wheel, grasp timer in upper left-hand corner and pull, releasing snap retainer and swinging timer to the right.
2. To change the regeneration cycle program, the program wheel must be removed. Grasp program wheel and squeeze protruding lugs toward center, lift program wheel off timer. Switch arms may require movement to facilitate removal.
3. Return timer to closed position engaging snap retainer in back plate. Make certain all electrical wires locate above snap retainer post.

Timer Setting Procedure

How To Change The Length Of The Backwash Time

The program wheel as shown in the drawing is in the service position. As you look at the numbered side of the program wheel, the group of pins starting at zero determines the length of time your unit will backwash.

For example, if there are six pins in this section, the time of backwash will be 12 min. (2 min. per pin). To change the length of backwash time, add or remove pins as required. The number of pins times two equals the backwash time in minutes.

How To Change The Length Of Brine And Rinse Time

1. The group of holes between the last pin in the backwash section and the second group of pins determines the length of time that your unit will brine and rinse (2 min. per hole).
2. To change the length of brine and rinse time, move the rapid rinse group of pins to give more or fewer holes in the brine and rinse section. Number of holes times two equals brine and rinse time in minutes.

How To Change The Length Of Rapid Rinse

1. The second group of pins on the program wheel determines the length of time that your water conditioner will rapid rinse (2 min. per pin).
2. To change the length of rapid rinse time, add or remove pins at the higher numbered end of this section as required. The number of pins times two equals the rapid rinse time in minutes.

How To Change The Length Of Brine Tank Refill Time

1. The second group of holes in the program wheel determines the length of time that your water conditioner will refill the brine tank (2 min. per hole).
2. To change the length of refill time, move the two pins at the end of the second group of holes as required.
3. The regeneration cycle is complete when the outer microswitch is tripped by the two pin set at end of the brine tank refill section.
4. The program wheel, however, will continue to rotate until the inner micro switch drops into the notch on the program wheel.

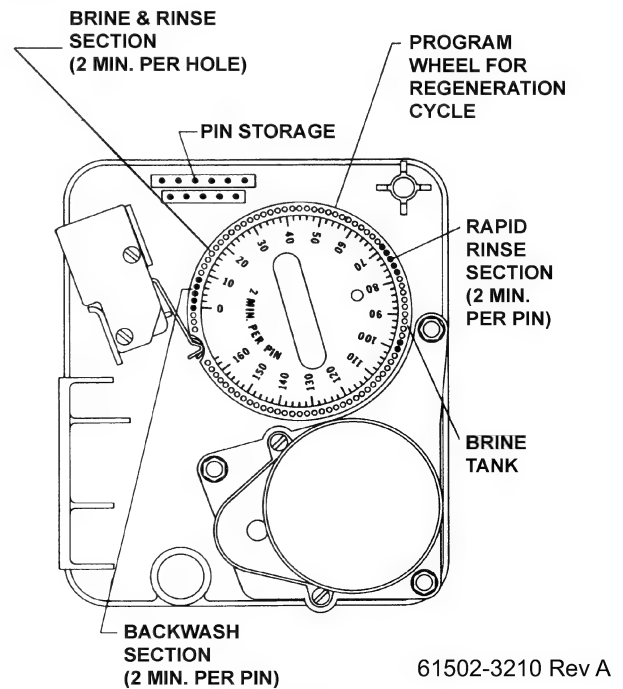
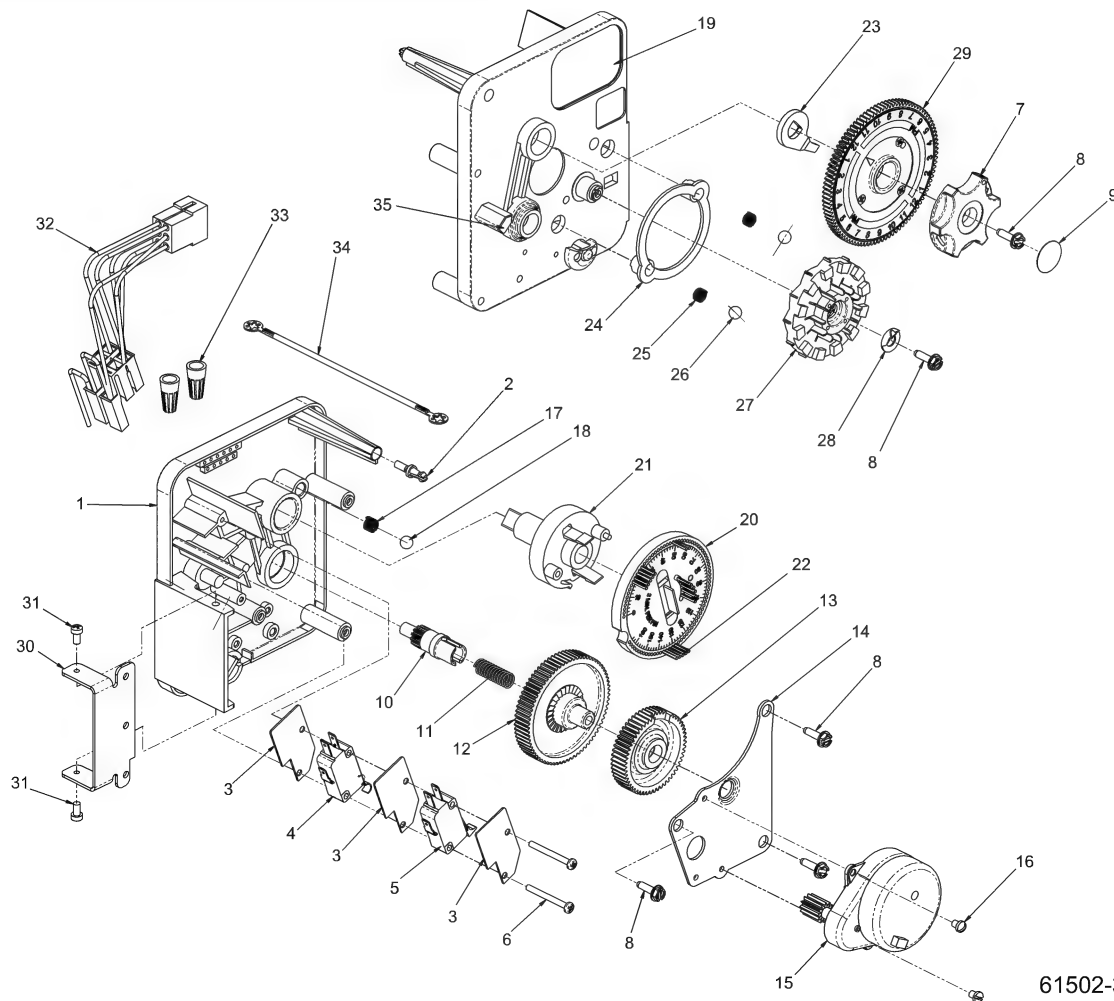


Figure 4

61502-3210 Rev A

3200 TIME CLOCK TIMER ASSEMBLY

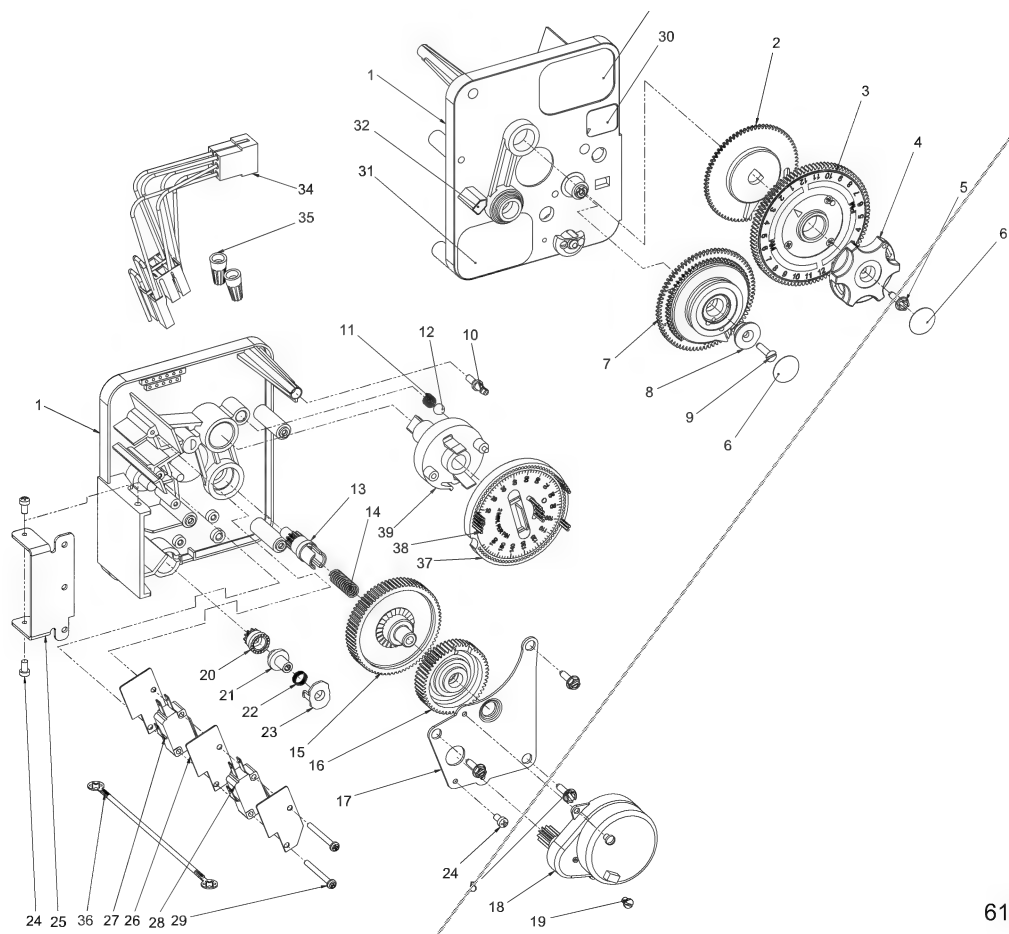


61502-3200 Rev A

| Item No. | QTY | Part No. | Description |
|----------|-----|----------|--------------------------------------|
| 1.....1 | 1 | 13870 | Housing, Timer, 3200 |
| 2.....1 | 1 | 14265 | Clip, Spring |
| 3.....3 | 3 | 14087 | Insulator |
| 4.....1 | 1 | 10896 | Switch, Micro |
| 5.....1 | 1 | 15320 | Switch, Micro, Timer |
| 6.....2 | 2 | 11413 | Screw, Pan Hd Mach, 4-40 x 1-1/8 |
| 7.....1 | 1 | 13886 | Knob, 3200 |
| 8.....5 | 5 | 13296 | Screw, Hex Wsh, 6-20 x 1/2 |
| 9.....1 | 1 | 11999 | Label, Button |
| 10.....1 | 1 | 13018 | Pinion, Idler |
| 11.....1 | 1 | 13312 | Spring, Idler Shaft |
| 12.....1 | 1 | 13017 | Gear, Idler |
| 13.....1 | 1 | 13164 | Gear, Drive |
| 14.....1 | 1 | 13887 | Plate, Motor Mounting |
| 15.....1 | 1 | 18743-1 | Motor, 120V, 60Hz, 1/30 RPM |
| | 1 | 18752-1 | Motor, 100V, 50Hz, 1/30 RPM |
| | 1 | 18824-1 | Motor, 23V, 50Hz, 1/30 RPM |
| | 1 | 18826-1 | Motor, 24V, 50Hz, 1/30 RPM |
| | 1 | 19659-1 | Motor, 24V, 60Hz, 1/30 RPM |
| | 1 | 19660-1 | Motor, 230V, 60Hz, 1/30 RPM |
| 16.....2 | 2 | 13278 | Screw, Sltd Fillister Hd 6-32 x .156 |

| Item No. | QTY | Part No. | Description |
|-----------|-----|----------|-----------------------------------|
| 17.....1 | 1 | 15424 | Spring, Detent, Timer |
| 18.....1 | 1 | 15066 | Ball, 1/4", Delrin |
| 19.....1 | 1 | 15465 | Label, Caution |
| 20.....1 | 1 | 19210 | Program Wheel Assy |
| 21.....1 | 1 | 13911 | Gear, Main Drive, Timer |
| 22.....17 | 17 | 41754 | Pin, Spring, 1/16 x 5/8 SS, Timer |
| 23.....1 | 1 | 13011 | Arm, Cycle Actuator |
| 24.....1 | 1 | 13864 | Ring, Skipper Wheel |
| 25.....2 | 2 | 13311 | Spring, Detent, Timer |
| 26.....2 | 2 | 13300 | Ball, 1/4", SS |
| 27.....1 | 1 | 14381 | Skipper Wheel Assy, 12 Day |
| | 1 | 14860 | Skipper Wheel Assy, 7 Day |
| 28.....1 | 1 | 13014 | Pointer, Regeneration |
| 29.....1 | 1 | 40096-24 | Dial, 12 AM Regen Assy, Black |
| | 1 | 40096-02 | Dial, 2 AM Regen Assy, Black |
| 30.....1 | 1 | 13881 | Bracket, Hinger Timer |
| 31.....2 | 2 | 11384 | Screw, Phil, 6-32 x 1/4 Zinc |
| 32.....1 | 1 | 13902 | Harness, 3200 |
| 33.....2 | 2 | 40422 | Nut, Wire, Tan |
| 34.....1 | 1 | 15354-01 | Wire, Ground, 4" |
| 35.....1 | 1 | 14007 | Label, Time of Day |

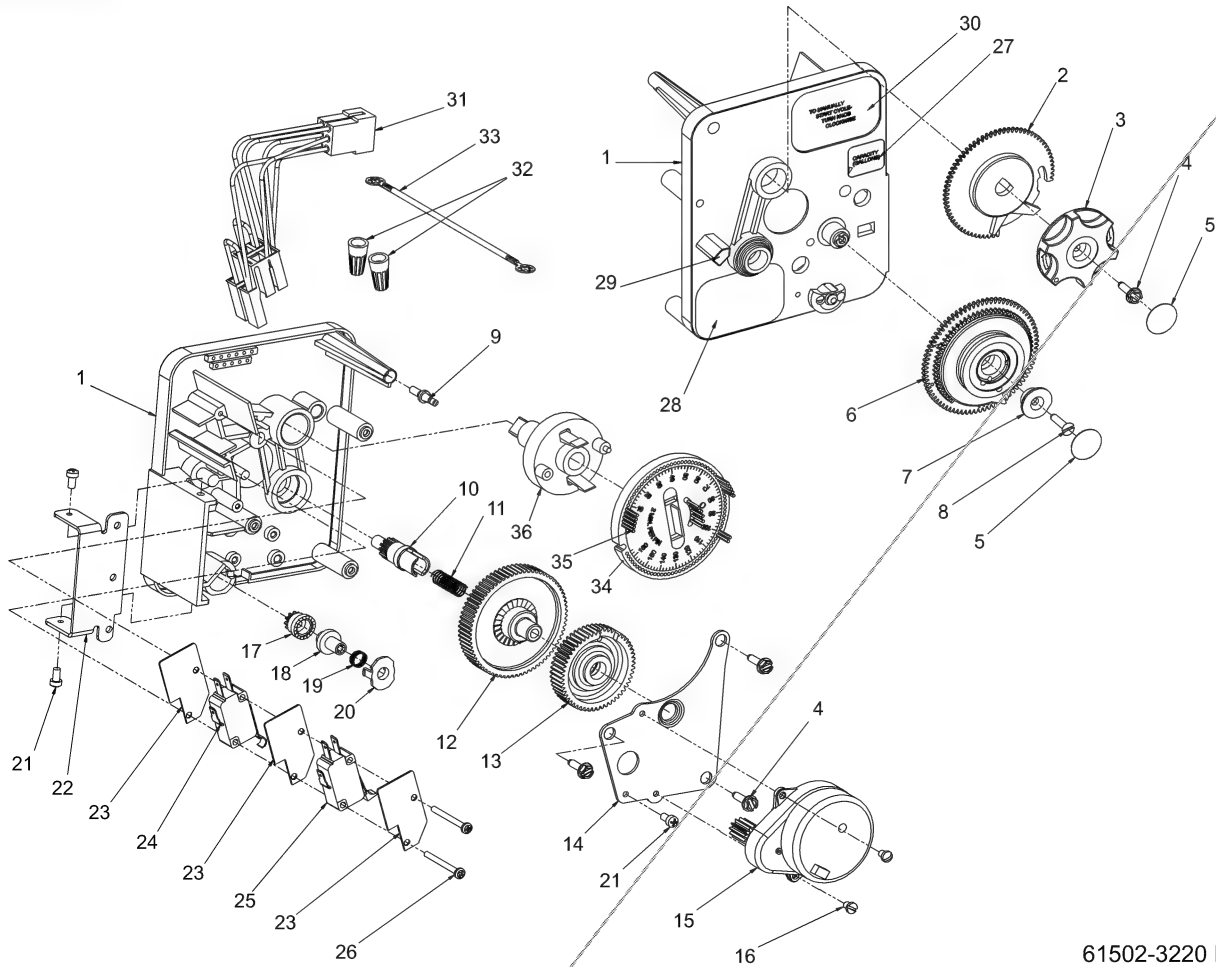
3210 METER DELAYED TIMER ASSEMBLY



61502-3210 Rev A

| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-----|---------------|--|----------|-----|---------------|-------------------------------------|
| 1..... | 1 | 13870..... | Housing, Timer, 3200 | 1 | 1 | 19660-1..... | Motor, 230V, 60Hz, 1/30 RPM |
| 2..... | 1 | 13802..... | Gear, Cycle Actuator | 19..... | 1 | 13278..... | Screw, Fillister Hd, 6-32 x .156 |
| 3..... | 1 | 40096-02..... | Dial 2 AM Regen Assy, Black | 20..... | 1 | 13830..... | Pinion, Program Wheel Drive |
| 4..... | 1 | 13886..... | Knob, 3200 | 21..... | 1 | 13831..... | Clutch, Drive Pinion |
| 5..... | 4 | 13296..... | Screw, Hex Wsh, 6-20 x 1/2 | 22..... | 1 | 14276..... | Spring, Meter, Clutch |
| 6..... | 2 | 11999..... | Label, Button | 23..... | 1 | 14253..... | Retainer, Clutch Spring |
| 7..... | 1 | 60405-15..... | Program Wheel, w/34" Std Label, w/People Label Set @ 21 | 24..... | 3 | 11384..... | Screw, Phil, 6-32 x 1/4 |
| 8..... | 1 | 13806..... | Retainer, Program Wheel | 25..... | 1 | 13881..... | Bracket, Hinge Timer |
| 9..... | 1 | 13748..... | Screw, Flat Head St, 6-20 x 1/2 | 26..... | 3 | 14087..... | Insulator |
| 10..... | 1 | 14265..... | Clip, Spring | 27..... | 1 | 10896..... | Switch, Micro |
| 11..... | 1 | 15424..... | Spring, Detent, Timer | 28..... | 1 | 15320..... | Switch, Micro, Timer |
| 12..... | 1 | 15066..... | Ball, 1/4" Delrin | 29..... | 2 | 11413..... | Screw, Pan Hd Mach, 4-40 x 1 1/8 |
| 13..... | 1 | 13018..... | Pinion, Idler | 30..... | 1 | 14198..... | Label, Indicator |
| 14..... | 1 | 13312..... | Spring, Idler Shaft | 31..... | 1 | 15465..... | Label, Caution |
| 15..... | 1 | 13017..... | Gear, Idler | 32..... | 1 | 14007..... | Label, Time of Day |
| 16..... | 1 | 13164..... | Gear, Drive | 33..... | 1 | 14045..... | Label, Instruction |
| 17..... | 1 | 13887..... | Plate, Motor Mounting | 34..... | 1 | 13902..... | Harness, 3200 |
| 18..... | 1 | 18743-1..... | Motor, 120V, 60Hz 1/30 RPM | 35..... | 2 | 40422..... | Nut, Wire, Tan |
| 1 | 1 | 18752-1..... | Motor, 100V, 50Hz, 1/30 RPM | 36..... | 1 | 15354-01..... | Wire, Ground, 4" |
| 1 | 1 | 18824-1..... | Motor, 23V, 50Hz, 1/30 RPM | 37..... | 1 | 19210..... | Program Wheel Assy |
| 1 | 1 | 18826-1..... | Motor, 24V, 50Hz, 1/30 RPM | 38..... | 17 | 41754..... | Pin, Spring, 1/16 x 5/8 SS, Timer |
| 1 | 1 | 19659-1..... | Motor, 24V, 60Hz, 1/30 RPM | 39..... | 1 | 13911..... | Gear, Main Drive, Timer |

3220 METER IMMEDIATE TIMER
ASSEMBLY

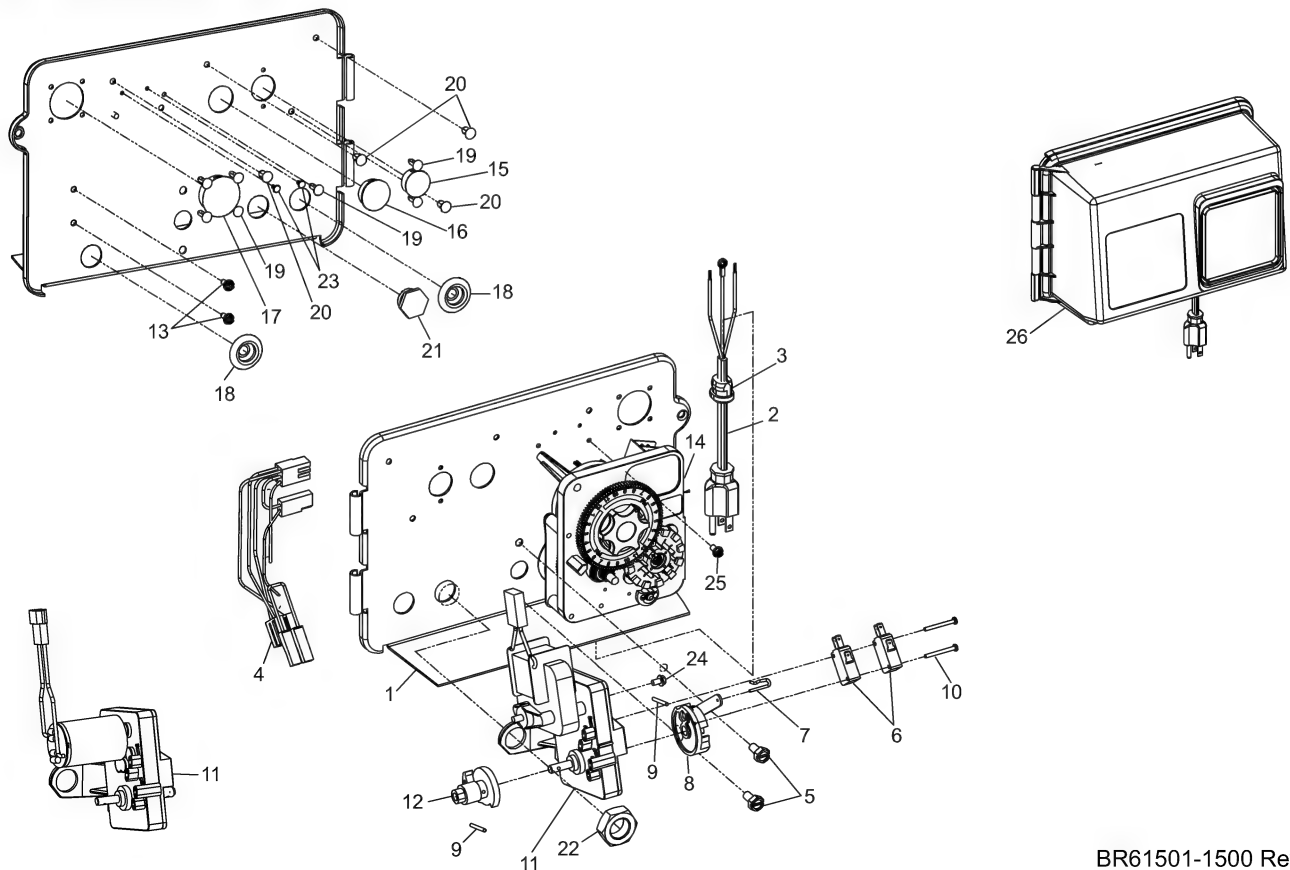


61502-3220 Rev B

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|---------------------------------|
| 1..... | 1 | 13870..... | Housing, Timer |
| 2..... | 1 | 15431..... | Gear, Cycle Actuator, System #5 |
| 3..... | 1 | 13886..... | Knob, 3200 |
| 4..... | 4 | 13296..... | Screw, Hex Wsh, 6-20 x 1/2 |
| 5..... | 2 | 11999..... | Label, Button |
| 6..... | 1 | 60408-50..... | Program Wheel, W/2" Std Label |
| 7..... | 1 | 13806..... | Retainer, Program Wheel |
| 8..... | 1 | 13748..... | Screw, Flt Hd St, 6-20 x 1/2 |
| 9..... | 1 | 14265..... | Spring Clip |
| 10..... | 1 | 13018..... | Pinion, Idler |
| 11..... | 1 | 18563..... | Idler Shaft Spring |
| 12..... | 1 | 13017..... | Gear, Idler |
| 13..... | 1 | 13164..... | Drive Gear |
| 14..... | 1 | 13887..... | Plate, Motor Mounting |
| 15..... | 1 | 18743-1..... | Motor, 120V, 60 Hz, 1/30 RPM |
| | 1 | 18752-1..... | Motor, 100V, 50Hz, 1/30 RPM |
| | 1 | 18824-1..... | Motor, 23V, 50Hz, 1/30 RPM |
| | 1 | 18826-1..... | Motor, 24V, 50Hz, 1/30 RPM |
| | 1 | 19659-1..... | Motor, 24V, 60Hz, 1/30 RPM |
| | 1 | 19660-1..... | Motor, 230V, 60Hz, 1/30 RPM |
| 16..... | 2 | 13278..... | Screw, Sltd Fillister Hd |
| 17..... | 1 | 14502..... | Pinion, Program Wheel |

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|--|
| 18..... | 1 | 14501..... | Clutch, Drive Pinion |
| 19..... | 1 | 14276..... | Meter Clutch Spring |
| 20..... | 1 | 14253..... | Retainer, Clutch Spring |
| 21..... | 3 | 11384..... | Screw, Phil, 6-32 x 1/4 Zinc |
| 22..... | 1 | 13881..... | Bracket, Hinge Timer |
| 23..... | 3 | 14087..... | Insulator |
| 24..... | 1 | 15414-00..... | Micro Switch |
| 25..... | 1 | 15320..... | Switch, Micro, Timer |
| 26..... | 2 | 11413..... | Screw, Pan Hd Mach, 4-40 x 1-1/8 |
| 27..... | 1 | 14198..... | Label, Indicator |
| 28..... | 1 | 15465..... | Label, Caution |
| 29..... | 1 | 14007..... | Label, Time of Day |
| 30..... | 1 | 15148..... | Label, Instruction |
| 31..... | 1 | 40617..... | Harness, 3220 |
| 32..... | 2 | 40422..... | Nut, Wire, Tan |
| 33..... | 1 | 15354-01..... | Wire, Ground, 4" |
| 34..... | 1 | 19210-05..... | Program Wheel Assembly, 9000/3230 |
| 35..... | 17 | 41754..... | Pin, Spring, 1/16 x 5/8 Stainless Steel, Timer |
| 36..... | 1 | 15055..... | Gear, Main Drive |

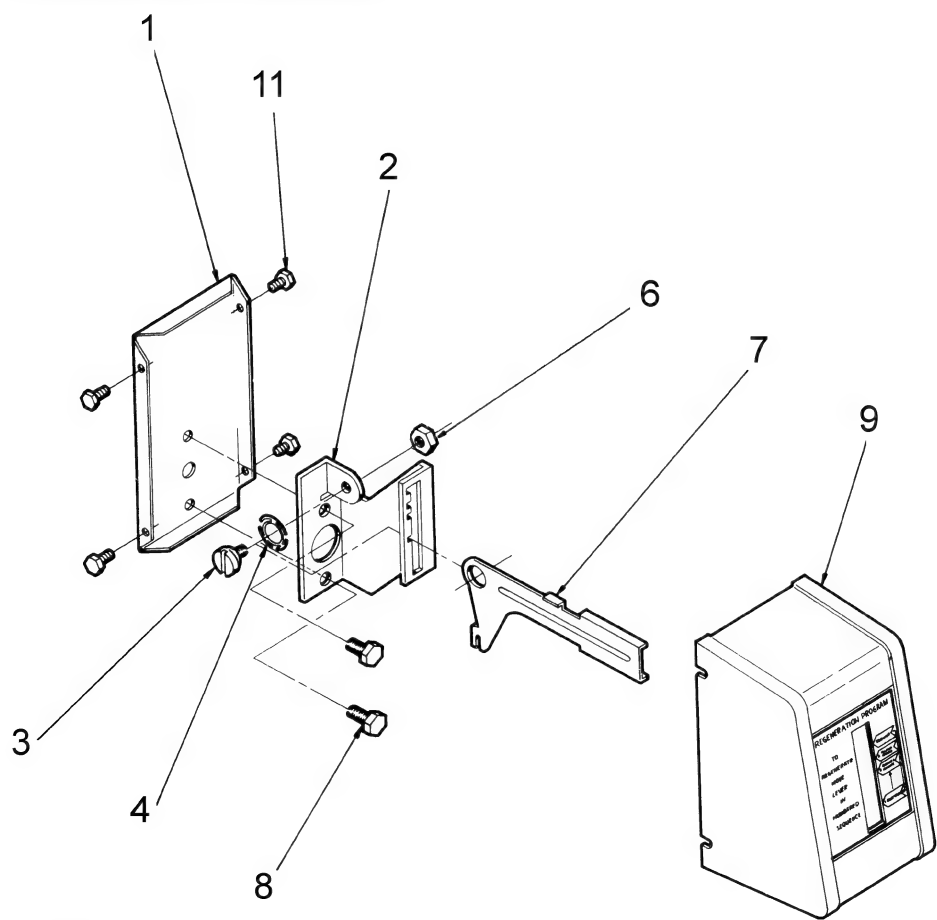
POWERHEAD ASSEMBLY (ENVIRONMENTAL)



BR61501-1500 Rev C

| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-----|---------------|---|-------------------|-----|---------------|--|
| 1..... | 1 | 18697-15..... | Backplate, Hinged | 15..... | 1 | 15806..... | Hole Plug, (HeyCo) |
| 2..... | 1 | 11838..... | Power Cord, 6', Fleck, Flat | 16..... | 1 | 16493..... | Plug, Hole, HeyCo, .88 Dia |
| 3..... | 1 | 13547..... | Strain Relief, Cord | 17..... | 1 | 17421..... | Plug, 1.20 Hole |
| 4..... | 1 | 40400..... | Harness, Drive Designr/Envirmtl | 18..... | 2 | 19691..... | Plug, .750 Dia. Hole, Flush |
| 5..... | 2 | 10231..... | Screw, Slot Hex 1/4-20 x 1/2 35 IN-LBS ±20% | 19..... | 7 | 19800..... | Plug (Hole Size: Dia .140) |
| 6..... | 2 | 10218..... | Switch, Micro | 20..... | 4 | 19801..... | Plug, Dia .190 |
| 7..... | 1 | 10909..... | Pin, Connecting Rod Spring | 21..... | 1 | 10712..... | Fitting, Brine Valve (Used on Filter Valves) |
| 8..... | 1 | 60160-15..... | Drive Cam Assy, STF, Blue, 2900 | 22..... | 1 | 10269..... | Nut, Jam, 3/4-16 (Used on Filter Valves) Wrench Tighten |
| 9..... | 2 | 10338..... | Pin, Roll, 3/32 x 7/8 | 23..... | 2 | 41581..... | Plug, Hole .125 Dia, White |
| 10..... | 2 | 14923..... | Screw, Pan Hd MACH, 4-40 x 1 5.0 IN-LBS ±10% | 24..... | 1 | 10872..... | Screw, Hex WSH, 8-32 x 5/16 20 IN-LBS ±20% |
| 11..... | 1 | 41543..... | Motor, Drive, 115V/60 Hz | 25..... | 1 | 14202-01..... | Screw, Hex Washer #8-32 x 5/16 Hand Tighten |
| | | 42579..... | Motor, Drive, 24 VAC/DC, 50-60 Hz, Fam 1 | 26..... | 1 | 60219-02..... | Cover Assy, Environmental, Black |
| | | 41545..... | Motor, Drive, 220V, 50-60Hz, SP, Fam 1 | | | | |
| 12..... | 1 | 12777..... | Cam, Shut-off Valve | Not Shown: | | | |
| 13..... | 2 | 10300..... | Screw, Hx Wash Head, 8 x 3/8 20 IN-LBS ±20% | 1..... | 1 | 15441..... | Cable Guide Assy, 2510 |
| 14..... | 1 | 3200..... | Timer Assy, 3200 7 or 12 Day | 1..... | 1 | 15495..... | Meter Cable, 13.87" |
| | | |3210 Meter Delay | | | | |
| | | |3220 Meter Immediate | | | | |

MANUAL POWERHEAD ASSEMBLY



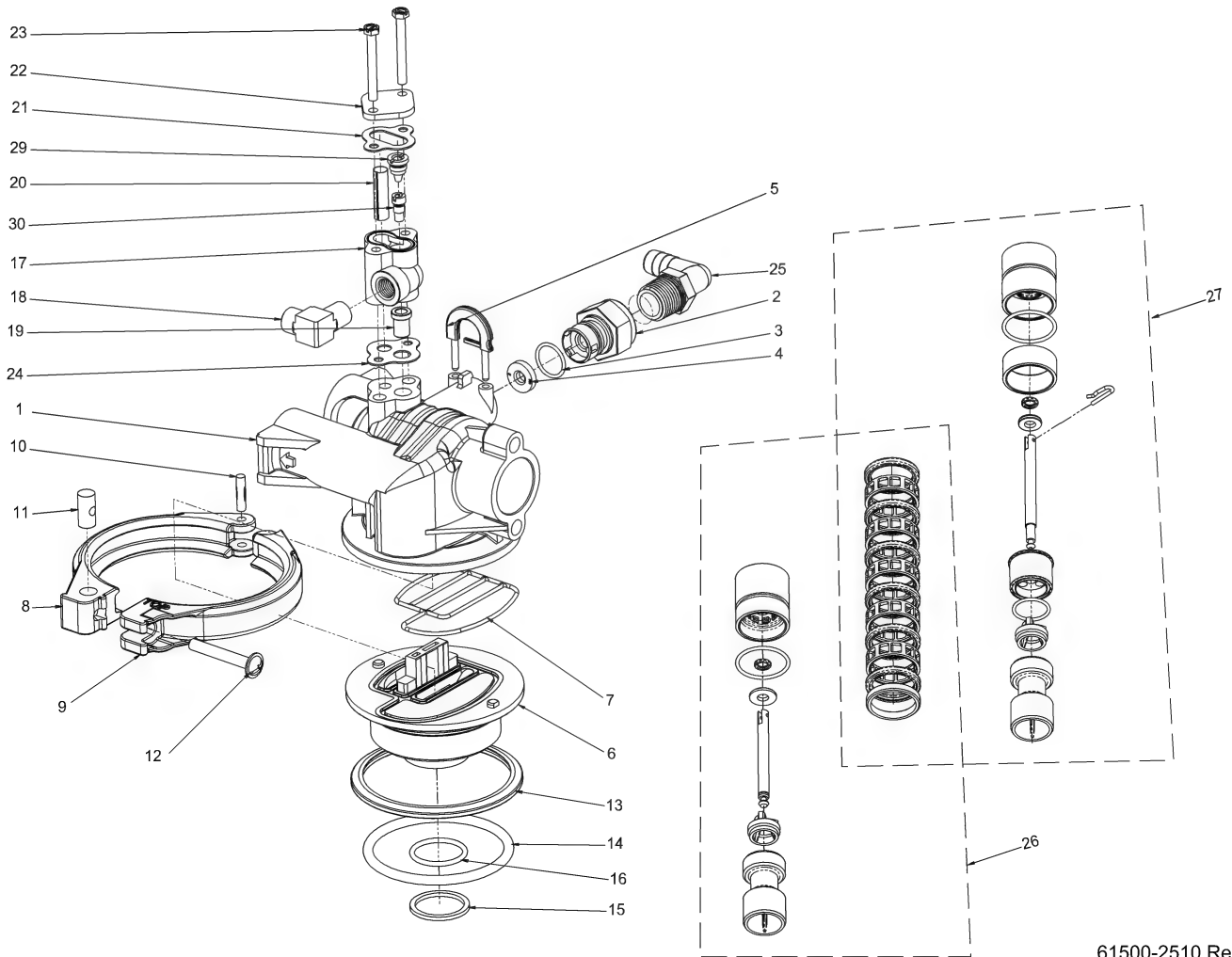
60409 Rev A

| Item No. | QTY | Part No. | Description |
|----------|---------|---------------|--|
| 1..... | 1 | 12593..... | Backplate, Manual |
| 2..... | 1 | 12592..... | Bracket, Lever Position |
| 3..... | 1 | 12596..... | Screw, Spec Mach, 1/4 - 20 x 1/2 |
| 4..... | 1 | 12707..... | Washer, Spring |
| 6..... | 1 | 11235..... | Nut, Hex, 1/4 - 20, Mach Screw, Zinc |
| 7..... | 1 | 12594..... | Lever, Valve Position |
| 8..... | 2 | 10231..... | Screw, Slot Hex, 1/4 - 20 x 1/2 18-8 SS |
| 9..... | 1 | 60224-32..... | Cover Assy, Manual, Filter |
| | 1 | 60224-33..... | Cover Assy, Manual, Softener |
| 11..... | 4 | 10300..... | Screw, Slot Hex Wsh, 8-18 x 3/8 Type "B" RC44-47 |

Not Shown:

| | | |
|---------|------------|-----------|
| 1 | 10909..... | Pin, Link |
|---------|------------|-----------|

CONTROL VALVE ASSEMBLY



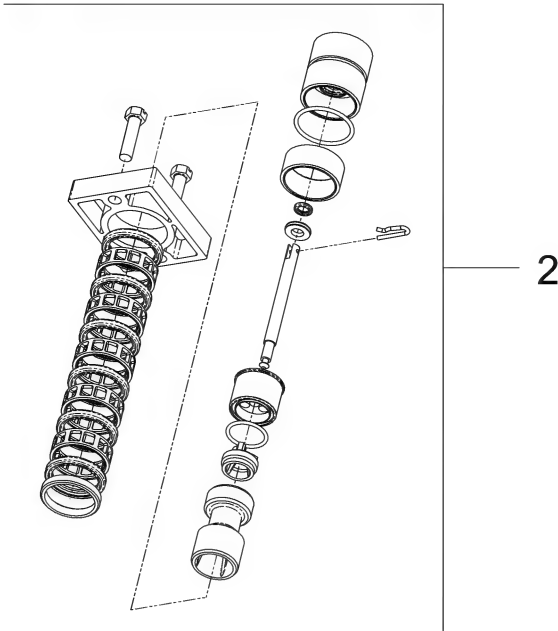
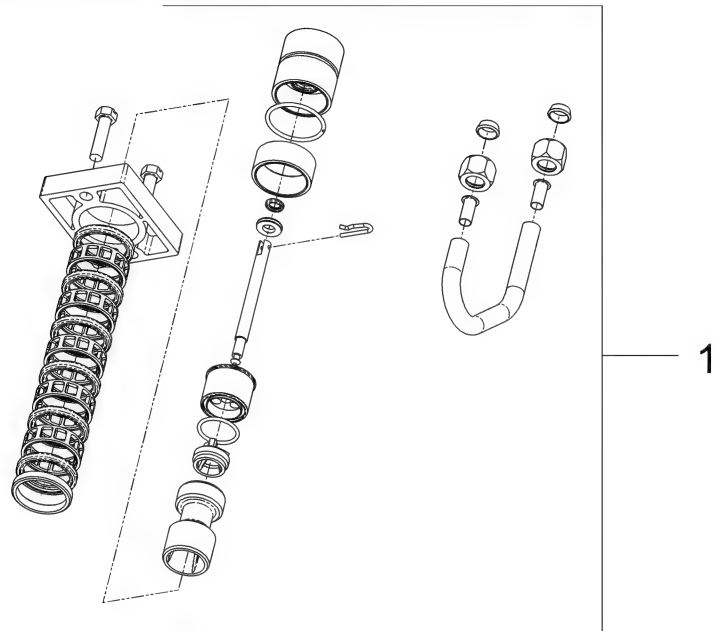
61500-2510 Rev B

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|--------------------------------|
| 1.....1 | 1 | 19328..... | Valve Body, 2510 |
| 2.....1 | 1 | 11385-01..... | Housing, Flow Control, Plastic |
| 3.....1 | 1 | 11183..... | O-ring, -017 |
| 4.....1 | 1 | 12408..... | Washer, Flow, 7.0 GPM |
| 5.....1 | 1 | 18312..... | Retainer, Drain |
| 6.....1 | 1 | 19322..... | Adapter Base, 2510 |
| 7.....1 | 1 | 19936..... | Seal, 2510, Base |
| 8.....1 | 1 | 19899..... | Clamp, Female, 2510 |
| 9.....1 | 1 | 19900..... | Clamp, Male, 2510 |
| 10.....1 | 1 | 40000..... | Pin, Hinge, Clamp |
| 11.....1 | 1 | 19998..... | Pivot, Clamp, 2510 |
| 12.....1 | 1 | 40057..... | Screw, Comb Hd, 114-20, 2" |
| 13.....1 | 1 | 19197..... | Ring, Slip |
| 14.....1 | 1 | 18303..... | O-ring, -336 |
| 15.....1 | 1 | 13030..... | Retainer, Dist Tube, O-ring |
| 16.....1 | 1 | 13304..... | O-ring, -121 |
| 17.....1 | 1 | 17776..... | Body, Injector, 1600 |
| 18.....1 | 1 | 10328..... | Fitting, Elbow, 90 Deg. |

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|--|
| 19.....1 | 1 | 16221..... | Disperser, Air |
| 20.....1 | 1 | 10227..... | Screen, Injector |
| 21.....1 | 1 | 10229..... | Gasket, Injector Cap, 1600 |
| 22.....1 | 1 | 11893..... | Cap, Injector, SS |
| 23.....2 | 2 | 10692..... | Screw, Slot Hex Hd, 10-24x |
| 24.....1 | 1 | 14805..... | Gasket, Injector Body, 1600/1700 |
| 25.....1 | 1 | 12338..... | Fitting, Elbow, 90 Deg. |
| 26.....1 | 1 | 61670-00..... | Piston Assy w/Seal & Spacer Kit 2510 Piston |
| 27.....1 | 1 | 61670-01..... | Piston Assy w/Seal & Spacer Kit 2510 Piston NHWPB |
| 28.....1 | 1 | 10757..... | Spacer, End |
| 29.....1 | 1 | 12973-3..... | Nozzle, Injector, #3, PVC |
| 30.....1 | 1 | 12974-3..... | Throat, Injector, #3, PVC |

NOTE: For optimal seal life, the use of lubricants is not recommended.

SOFTENER FILTER CONVERSION KITS

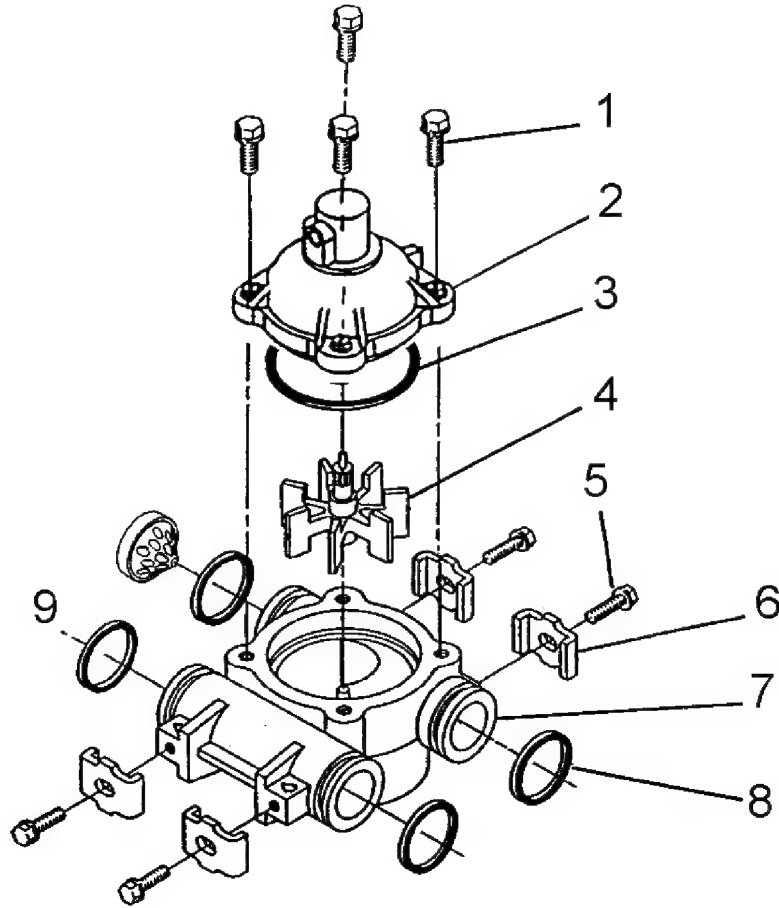


61671 Rev E

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|---|
| 1..... | | 61671-01..... | Piston Conversion w/Seal & Spacer 2510 NHWBP 1600 |
| 2..... | | 61671-00..... | Piston Kit w/Seal & Spacer 2510 NHWBP Filter |

NOTE: For optimal seal life, the use of lubricants is not recommended.

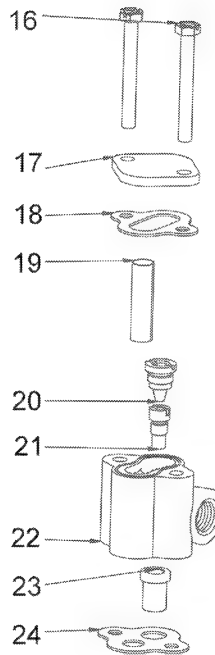
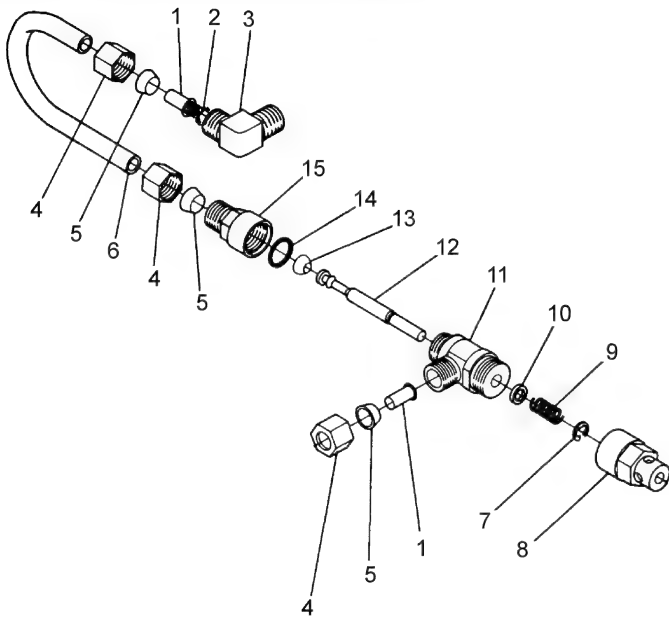
METER ASSEMBLY



60088 Rev E

| Item No. | QTY | Part No. | Description |
|----------|---------|------------|--|
| 1..... | 4 | 12473..... | Screw - Meter Cover Assembly |
| 2..... | 1 | 15659..... | Meter Cover Assy. - Ext., Rt. Angle (Not Shown) |
| ..... | 1 | 15452..... | Meter Cap Assy, 3/4" to 2", Std, Rt Ang/90, Plastic Paddle |
| 3..... | 1 | 13847..... | O-ring - Meter Cover Assembly |
| 4..... | 1 | 13509..... | Impeller |
| 5..... | 4 | 13314..... | Screw - Adapter Clip |
| 6..... | 4 | 13255..... | Adapter Clip |
| 7..... | 1 | 13821..... | Meter Body |
| 8..... | 4 | 13305..... | O-ring - Meter Body |
| 9..... | 1 | 14613..... | Flow Straightener |

1600 BRINE SYSTEM ASSEMBLY



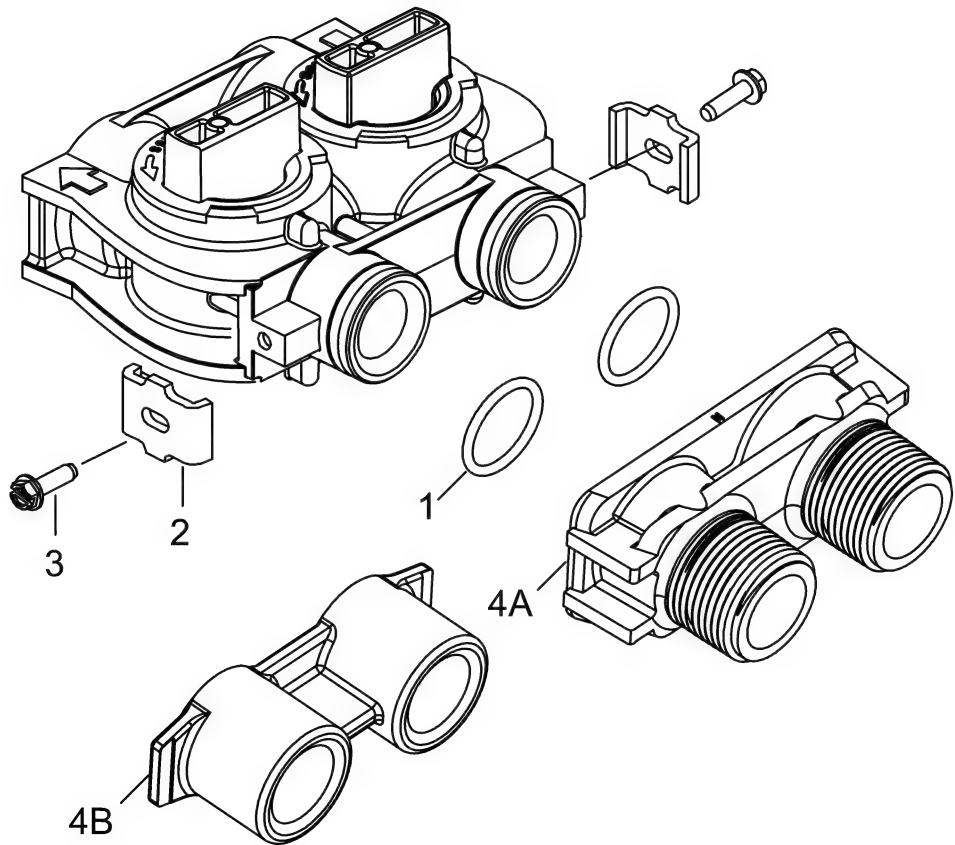
60029 Rev C

| Item No. | QTY | Part No. | Description |
|----------------|---------------|--|-------------|
| 1.....2 | 10332..... | Fitting, Insert, 3/8 | |
| 2.....1 | 12767..... | Screen, Brine | |
| 3.....1 | 10328..... | Fitting, Elbow, 90 Deg. 1/4 PT x 3/8Tube | |
| 4.....3 | 10329..... | Fitting, Tube, 3/8 Nut, Brass | |
| 5.....3 | 10330..... | Fitting, Sleeve, 3/8 Celcon | |
| 6.....1 | 16508..... | Tube, Brine, 1600, PVC | |
| 1..... | 16508-01..... | Tube, Brine Valve, 2850/2900s | |
| 1..... | 12774..... | Tube, Brine Valve, 1500 | |
| 1..... | 40027..... | Tube, Brine Valve, 2510 | |
| 1..... | 15221..... | Tube, Brine Valve, 2750/2900 | |
| 1..... | 42184..... | Tube, Brine Valve, 2850s | |
| 1..... | 41683* | Tube, Brine Valve, UF, 1600/1650 | |
| 7.....1 | 10250..... | Ring, Retaining | |
| 8.....1 | 11749..... | Guide, Brine Valve Stem | |
| 9.....1 | 10249..... | Spring, Brine Valve | |
| 10.....1 | 12550..... | Quad Ring, -009 | |
| 11.....1 | 12748..... | Brine Valve Body Assy, 1600 w/ Quad Ring | |

| Item No. | QTY | Part No. | Description |
|----------|---------|-----------------|--|
| 12..... | 1 | 12552-02..... | Brine Valve Stem, 1600, with seat |
| 13..... | 1 | 12626..... | Seat, Brine Valve |
| 14..... | 1 | 11982..... | O-ring, -016 |
| 15..... | 1 | 60020-25..... | BLFC, .25 GPM, 1600 |
| | 1 | 60020-50..... | BLFC, .50 GPM, 1600 |
| | 1 | 60020-100..... | BLFC, 1.0 GPM, 1600 |
| 16..... | 2 | 10692..... | Screw, Slot Hex Hd, 10 - 24X 18-8 Stainless Steel |
| 17..... | 1 | 11893..... | Cap, Injector, SS |
| 18..... | 1 | 10229..... | Gasket, Injector Cap, 1600 |
| 19..... | 1 | 10227..... | Screen, Injector |
| 20..... | 1 | 10913-xx..... | Nozzle, Injector, -xx is for injector size |
| 21..... | 1 | 10914-xx..... | Throat, Injector, -xx is for injector size |
| 22..... | 1 | 17776..... | Body, Injector, 1600 |
| | 1 | 17776-02* | Body, Injector, 1600 Upflow |
| 23..... | 1 | 16221..... | Disperser, Air |
| 24..... | 1 | 14805..... | Gasket, Injector Body, 1600/1700 |

*Upflow Only

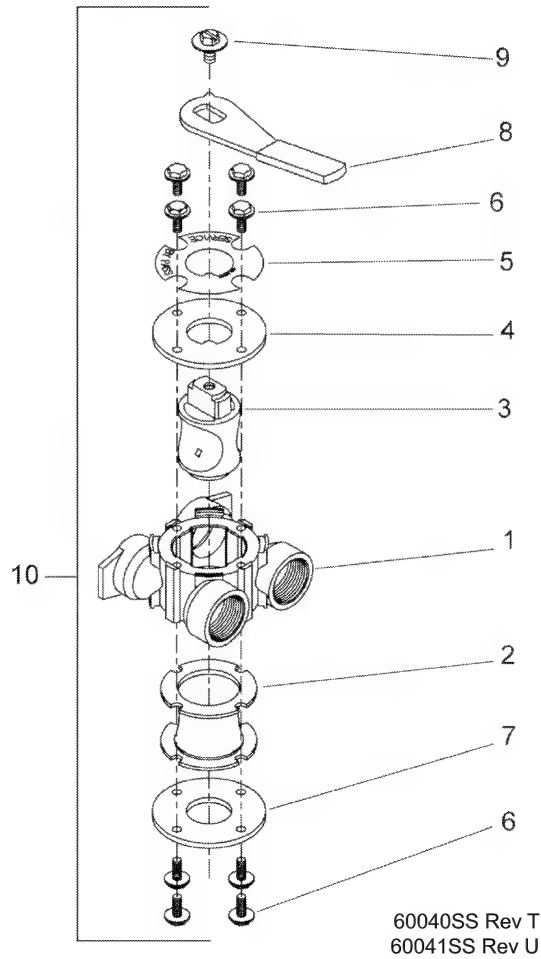
BYPASS VALVE ASSEMBLY (PLASTIC)



60049 Rev G

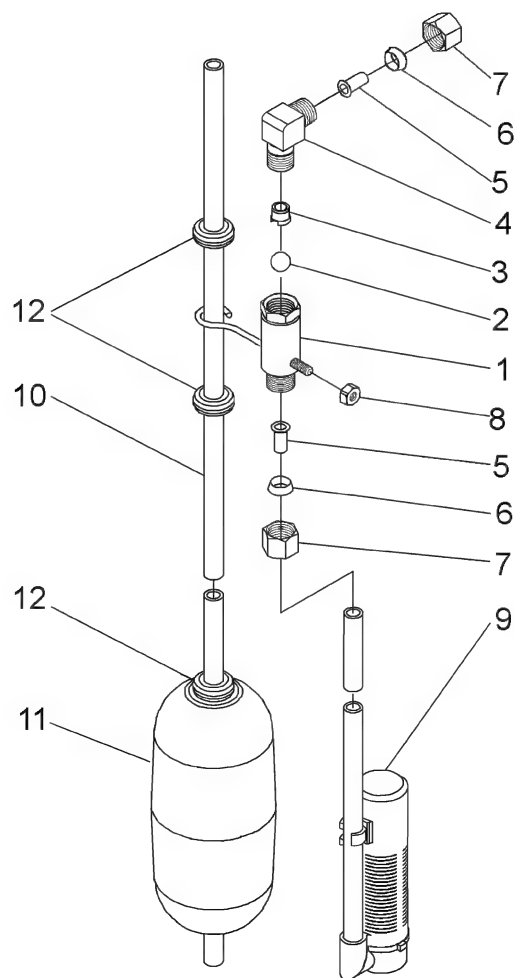
| Item No. | QTY | Part No. | Description |
|----------|---------|---------------|---|
| 1..... | 2 | 13305..... | O-ring, -119 |
| 2..... | 2 | 13255..... | Clip, Mounting |
| 3..... | 2 | 13314..... | Screw, Slot Ind Hex, 8-18 x .60 |
| 4A | 1 | 18706..... | Yoke, 1", NPT, Plastic |
| | | 18706-02..... | Yoke, 3/4", NPT, Plastic |
| 4B | 1 | 13708-40..... | Yoke, 1", Sweat |
| | | 13708-45..... | Yoke, 3/4", Sweat |
| | | 19275..... | Yoke, Angle 90 Deg, 3/4", NPT |
| | | 19275-45..... | Yoke, Angle 90 Deg, 3/4" Sweat |
| | | 19620-01..... | Yoke Assy, 3/4", R/Angle, 90 Deg w/O-rings, Clips & Screws |
| | | 40636..... | Yoke, 1 1/4", NPT |
| | | 40636-49..... | Yoke, 1 1/4", Sweat |
| | | 41027-01..... | Yoke, 3/4", NPT, Cast, Machined |
| | | 41026-01..... | Yoke, 1", NPT, Cast, Machined, SS |

BYPASS VALVE ASSEMBLY (METAL)



| Item No. | QTY | Part No. | Description |
|----------|---------|--------------------|--|
| 1..... | 1 | 40614..... | Bypass Body, 3/4" |
| | | 40634..... | Bypass Body, 1", SS |
| 2..... | 1 | 14105..... | Seal, Bypass, 560CD |
| 3..... | 1 | 11972..... | Plug, Bypass |
| 4..... | 1 | 11978..... | Side Cover |
| 5..... | 1 | 13604-01..... | Label |
| 6..... | 8 | 15727..... | Screw |
| 7..... | 1 | 11986..... | Side Cover |
| 8..... | 1 | 11979..... | Lever, Bypass |
| 9..... | 1 | 11989..... | Screw, Hex Head, 1/4-14 |
| 10..... | 1 | 60040SS..... | Bypass Valve, 5600, 3/4" NPT Blk Grip Lever, SS |
| | | 60041SS..... | Bypass Valve, 5600, 1" NPT Blk Grip Lever, SS |

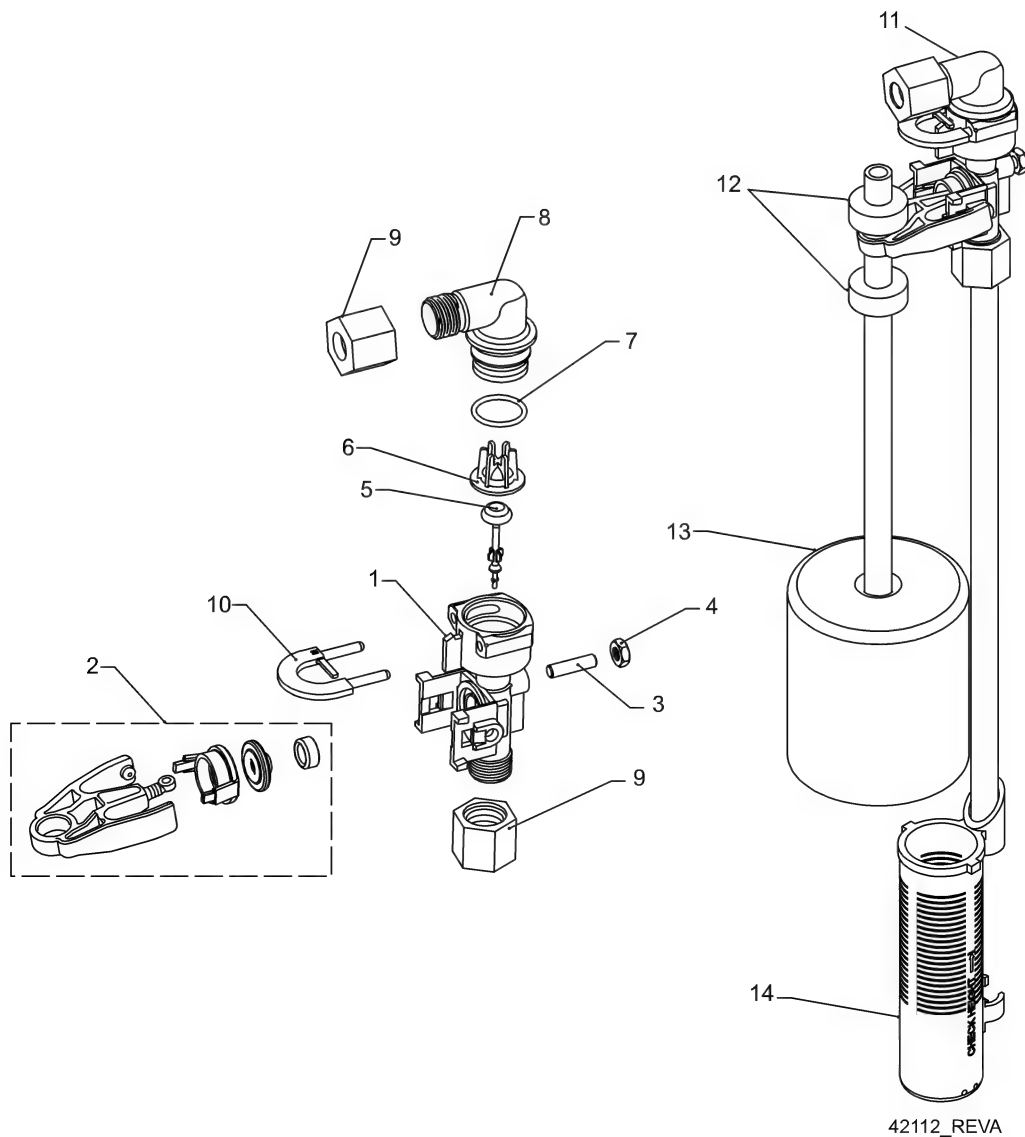
2300 SAFETY BRINE VALVE



60027 Rev D

| Item No. | QTY | Part No. | Description |
|----------|---------|---------------|--|
| 1..... | 1 | 60027-00..... | Safety Brine Valve, 2300, Less Elbow |
| 2..... | 1 | 10138..... | Ball, 3/8", Brass |
| 3..... | 1 | 11566 | Ball Stop, Slow Fill |
| 4..... | 1 | 10328..... | Fitting, Elbow, 90 Deg. 1/4 NPT x 3/8 Tube |
| 5..... | 1 | 10332..... | Fitting, Insert, 3/8 |
| 6..... | 1 | 10330..... | Fitting, Sleeve, 3/8 Celcon |
| 7..... | 1 | 10329..... | Fitting, Tube, 3/8 Nut, Brass |
| 8..... | 1 | 10186..... | Nut, Hex, 10-32 |
| 9..... | 1 | 60002-34..... | Air Check, #500, 34" Long |
| | | 60003-34..... | Air Check, #500, HW, 34" Tube |
| 10..... | 1 | 10149..... | Rod, Float |
| 11 | 1 | 10700..... | Float Assy, White |
| 12..... | 3 | 10150..... | Grommet, .30 Dia |

2310 SAFETY BRINE VALVE



| Item No. | QTY | Part No. | Description |
|----------|---------|---------------|----------------------------------|
| 1..... | 1 | 19645..... | Body, Safety Brine Valve, 2310 |
| 2..... | 1 | 19803..... | Safety Brine Valve Assy |
| 3..... | 1 | 19804..... | Screw, Sckt Hd, Set, 10-24 x .75 |
| 4..... | 1 | 19805..... | Nut, Hex, 10-24, Nylon Black |
| 5..... | 1 | 19652-01..... | Poppet Assy, SBV w/O-ring |
| 6..... | 1 | 19649..... | Flow Dispenser |
| 7..... | 1 | 11183 | O-ring, -017 |
| 8..... | 1 | 19647 | Elbow, Safety Brine Valve |
| 9..... | 2 | 19625..... | Nut Assy, 3/8" Plastic |
| 10..... | 1 | 18312..... | Retainer, Drain |
| 11..... | 1 | 60014..... | Safety Brine Valve Assy, 2310 |
| 12..... | 2 | 10150..... | Grommet, .30 Dia |
| 13..... | 1 | 60068-30..... | Float Assy, 2310, w/30" Rod |
| 14..... | 1 | 60002-34..... | Air Check, #500, 34" Long |

SEAL & SPACER TOOLS & REPLACEMENT

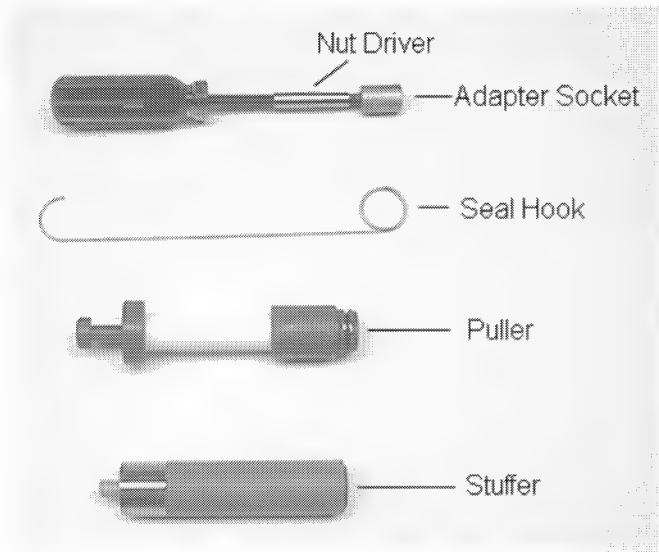


Figure 5

Tools Used in the Seal and Spacer Replacement

| Description | Part No. |
|----------------------|----------|
| Nut Driver | 12664 |
| Socket Adapter | 16906 |
| Socket 7/16" | 12665 |
| Seal Hook | 12874 |
| Puller | 13061 |
| Stuffer | 11098 |

NOTE: Photos shown are for reference only for replacing the seal and spacer. Actual valve may be different.

1. Turn off water supply to valve. Next, cycle valve to backwash position, then to service. Now remove electrical plug from outlet.
2. Remove control box cover.
3. Disconnect the brine line from the injector housing to the brine valve (if your unit has timed brine tank fill).
4. Remove the two capscrews that hold the back plate to the valve.
5. Grasp the back plate on both sides and slowly pull end plug and piston assembly out of the valve body (see Figure 6) and lay aside.

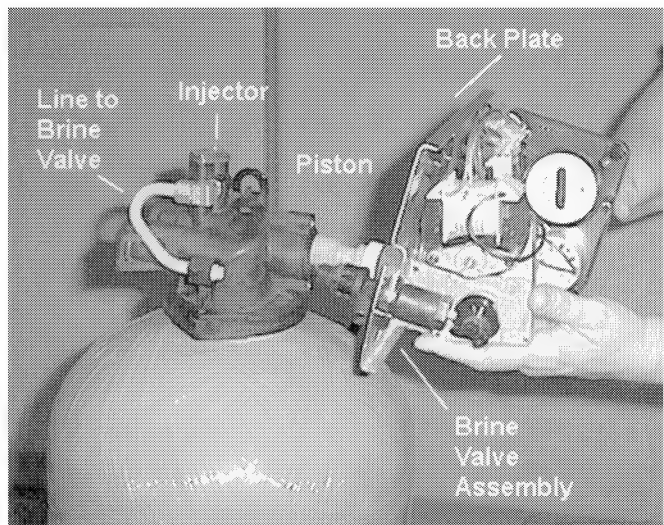


Figure 6

6. Remove the seal first using the wire hook with the finger loop (see Figure 7).

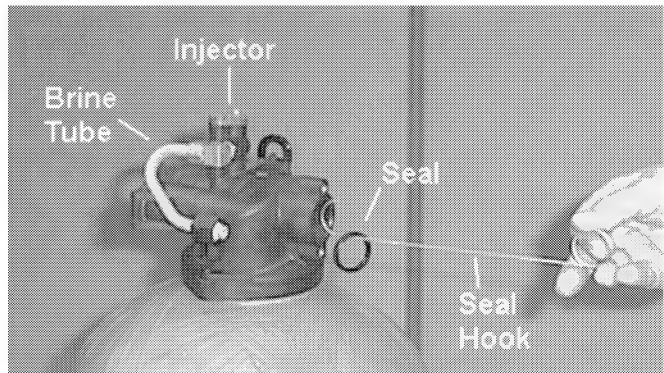


Figure 7

7. The spacer tool (use only for removing the spacers) has three retractable pins, retained by a rubber ring, at one end. They are retracted or pushed out by pulling or pushing the center button the opposite end.
8. Insert the pin end of the spacer tool into the valve body with the pins retracted (button pulled back). Push the tool tight against the spacer and push the button in, (see ?). When the button is pushed in, the pins are pushed out to engage the 1/4 dia. holes in the spacer. Remove the tool from the valve body. The spacer will be on the end. Pull the center button back, the pins will be retracted and the spacer can be removed from the spacer tool.

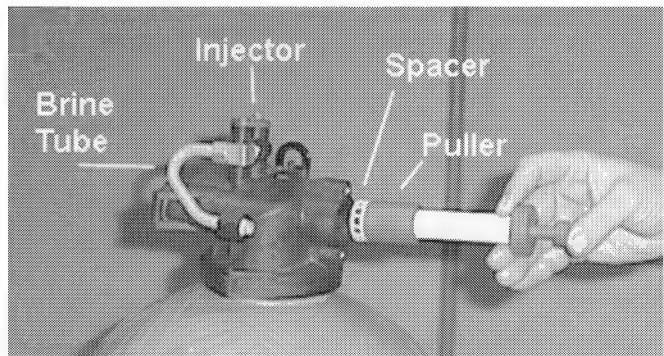


Figure 8

SEAL & SPACER TOOLS & REPLACEMENT *continued*

9. Alternately remove the remaining seals and spacers in accordance with steps No. 6 and 8.
10. The last or end spacer does not have any holes for the pins of the spacer tool to engage, therefore if the end spacer does not come out on the first try, try again using the wire hook with the finger loop.
11. To replace seals, spacers and end ring, use special tool with the brass sleeve on one end. This is a double-purpose tool (see ?). The male end acts as a pilot to hold the spacers as they are pushed into the valve body and the brass female end is used to insert the seals into the valve body.

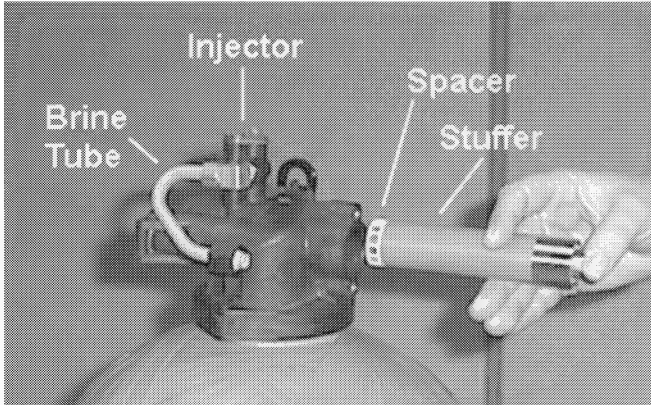


Figure 9

12. To restuff a valve body, first take the end ring (the plastic or brass ring without holes), then with your thumb press the button on the brass sleeve end. The large dia. inner portion is now exposed (see Figure 8). Place the end ring on this pilot with the lip on the end ring facing the tool. Push the tool into the valve body bore until it bottoms. While the tool is in the valve body, take a seal and press it into the inside diameter of the exposed brass female end.
13. Remove the tool, turn it end for end and insert it into the valve body bore. While holding the large dia. of the tool, slide it all the way into the valve body bore until it bottoms. Then push the center button to push the seal of the tool and leave it in place in the valve body.
14. Remove the tool from the valve body and push the center on the brass female end to expose the pilot on the opposite end. Place a spacer on this end and insert the spacer and tool into the valve.

GENERAL SERVICE HINTS FOR METER CONTROL

Problem: Softener delivers hard water

Reason: Reserve capacity has been exceeded.

Correction: Check salt dosage requirements and reset program wheel to provide additional reserve.

Reason: Program wheel is not rotating with meter output.

Correction: Pull cable out of meter cover and rotate manually. Program wheel must move without binding and clutch must give positive clicks when program wheel strikes regeneration stop. If it does not, replace timer.

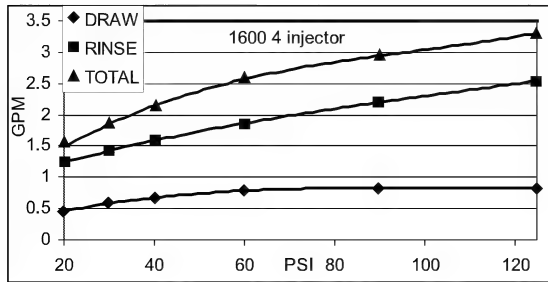
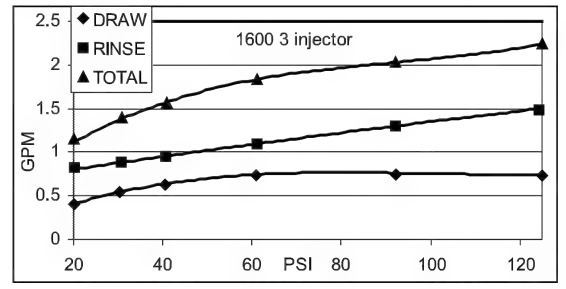
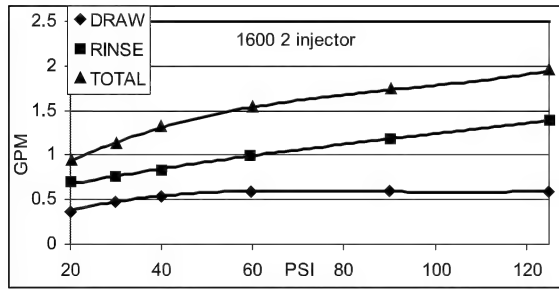
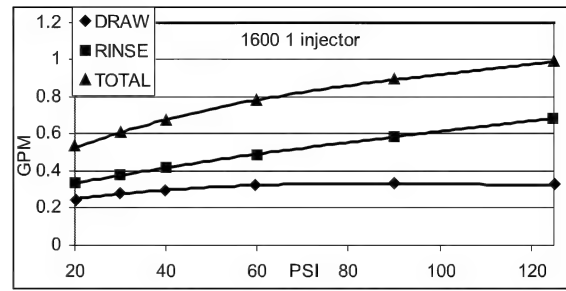
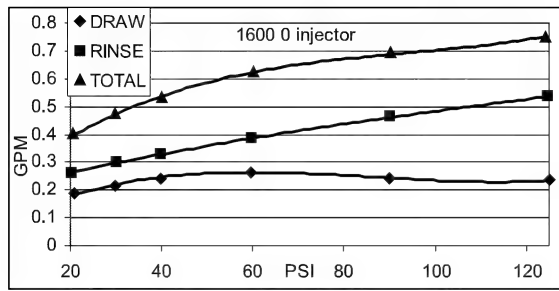
Reason: Meter is not measuring flow.

Correction: Check meter with meter checker.

TROUBLESHOOTING

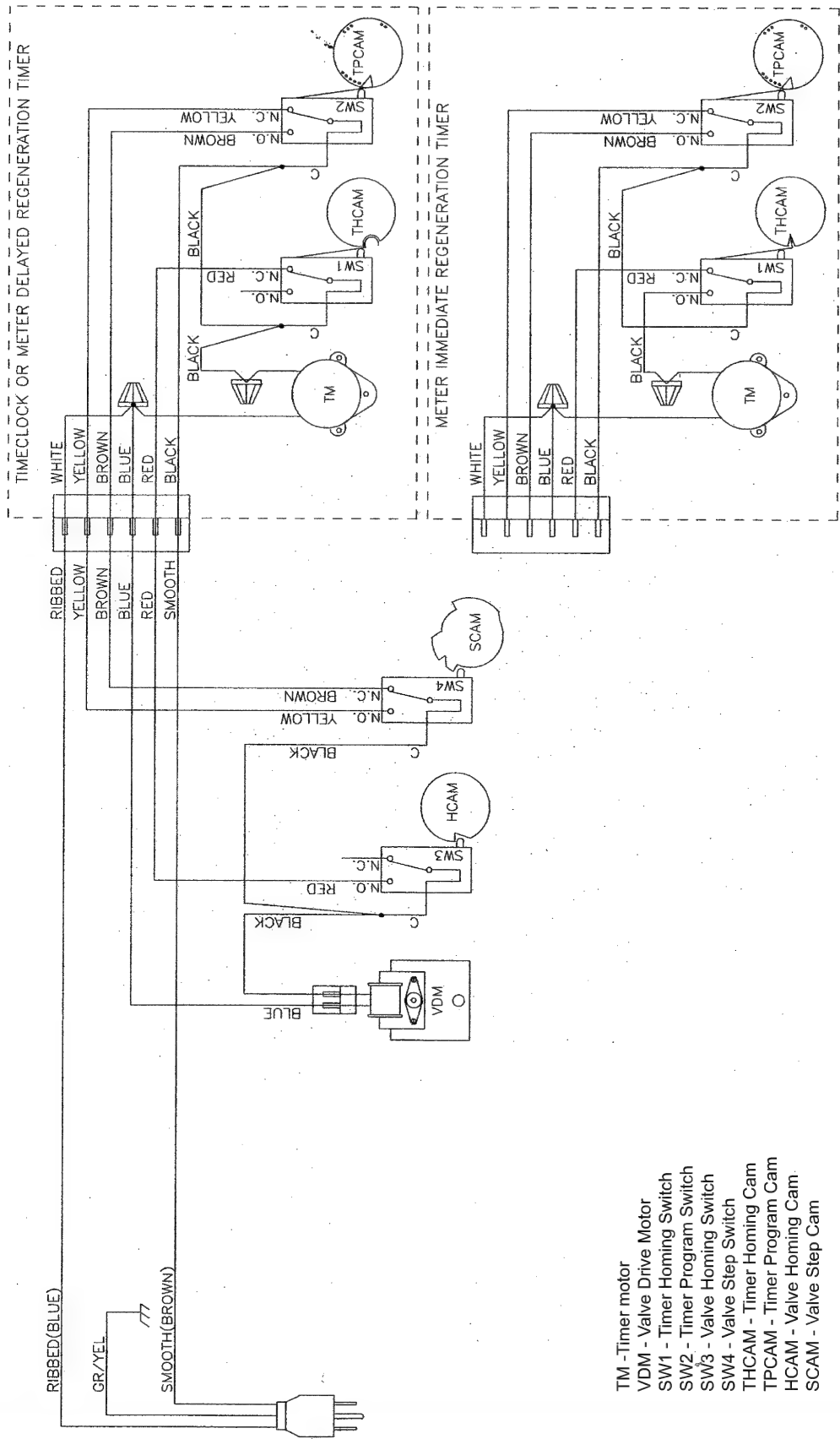
| Problem | Cause | Correction |
|--|--|---|
| Water conditioner fails to regenerate. | Electrical service to unit has been interrupted | Assure permanent electrical service (check fuse, plug, pull chain, or switch) |
| | Timer is defective. | Replace timer. |
| | Power failure. | Reset time of day. |
| Hard water. | By-pass valve is open. | Close by-pass valve. |
| | No salt is in brine tank. | Add salt to brine tank and maintain salt level above water level. |
| | Injector screen plugged. | Clean injector screen. |
| | Insufficient water flowing into brine tank. | Check brine tank fill time and clean brine line flow control if plugged. |
| | Hot water tank hardness. | Repeated flushings of the hot water tank is required. |
| | Leak at distributor tube. | Make sure distributor tube is not cracked. Check O-ring and tube pilot. |
| | Internal valve leak. | Replace seals and spacers and/or piston. |
| Unit used too much salt. | Improper salt setting. | Check salt usage and salt setting. |
| | Excessive water in brine tank. | See "Excessive water in brine tank". |
| Loss of water pressure. | Iron buildup in line to water conditioner. | Clean line to water conditioner. |
| | Iron buildup in water conditioner. | Clean control and add mineral cleaner to mineral bed. Increase frequency of regeneration. |
| | Inlet of control plugged due to foreign material broken loose from pipes by recent work done on plumbing system. | Remove piston and clean control. |
| Loss of mineral through drain line. | Air in water system. | Assure that well system has proper air eliminator control. Check for dry well condition. |
| | Improperly sized drain line flow control. | Check for proper drain rate. |
| Iron in conditioned water. | Fouled mineral bed. | Check backwash, brine draw, and brine tank fill. Increase frequency of regeneration. Increase backwash time. |
| Excessive water in brine tank. | Plugged drain line flow control. | Clean flow control. |
| | Plugged injector system. | Clean injector and screen. |
| | Timer not cycling. | Replace timer. |
| | Foreign material in brine valve. | Replace brine valve seat and clean valve. |
| | Foreign material in brine line flow control. | Clean brine line flow control. |
| Softener fails to draw brine. | Drain line flow control is plugged. | Clean drain line flow control. |
| | Injector is plugged. | Clean injector |
| | Injector screen plugged. | Clean screen. |
| | Line pressure is too low. | Increase line pressure to 20 psi |
| | Internal control leak | Change seals, spacers, and piston assembly. |
| | Service adapter did not cycle. | Check drive motor and switches. |
| Control cycles continuously. | Misadjusted, broken, or shorted switch. | Determine if switch or timer is faulty and replace it, or replace complete power head. |
| Drain flows continuously. | Valve is not programming correctly. | Check timer program and positioning of control. Replace power head assembly if not positioning properly. |
| | Foreign material in control. | Remove power head assembly and inspect bore. Remove foreign material and check control in various regeneration positions. |
| | Internal control leak. | Replace seals and piston assembly. |

FLOW DATA & INJECTOR DRAW RATES



TR20391_REVA

WIRING



- TM - Timer motor
- VDM - Valve Drive Motor
- SW1 - Timer Homing Switch
- SW2 - Timer Program Switch
- SW3 - Valve Homing Switch
- SW4 - Valve Step Switch
- THCAM - Timer Homing Cam
- TPCAM - Timer Program Cam
- HCAM - Valve Homing Cam
- SCAM - Valve Step Cam

NOTE:

1. Single Tank Timeclock, Meter Delayed, or Meter Immediate Regeneration
2. Valve Shown In Service Position.

19201 Rev C

SERVICE ASSEMBLIES

24 Hour Gear Assemblies

| | |
|----------------|---|
| 40096-02 | Dial 2AM Regen Assy, Black |
| 40096-24 | Dial 12AM Regen Assy, Black |
| 60519-02 | Gear Assy, 3200 24 Hour 2 Times/Day |
| 60519-03 | Gear Assy, 3200, 24 Hour 3 Times/Day |
| 60519-04 | Gear Assy, 3200, 24 Hour 4 Times/Day |
| 60519-06 | Gear Assy, 3200, 24 Hour (12:00) 6 Times/Day |

Brine Line Flow Control (BLFC)

| | |
|-----------------|------------------------------|
| 60010-25 | BLFC, 1650, .25 GPM, Plastic |
| 60010-50 | BLFC, 1650, .50 GPM, Plastic |
| 60010-100 | BLFC, 1650, 1.0 GPM, Plastic |

Brine Valves

| | |
|----------------|--|
| 60011-010..... | Brine Valve, 1650, Short Stem, .25 GPM, Less Tube |
| 60011-030..... | Brine Valve, 1650, Short Stem, 1.0 GPM, Less Tube |

Bypasses

| | |
|--------------|------------------------------|
| 60049..... | Bypass Plastic Assy |
| 60040SS..... | Bypass Valve, 5600, 3/4" NPT |
| 60041SS..... | Bypass Valve, 5600, 1" NPT |

Cam

| | |
|----------------|---------------------------|
| 60160-15 | Drive Cam Assy, STF, Blue |
|----------------|---------------------------|

Clamp

| | |
|------------|---------------------------|
| 60503..... | Clamp Ring Assembly, 2510 |
|------------|---------------------------|

Coupling

| | |
|------------|-----------------------------|
| 60510..... | Adapter Coupling Assy, 5600 |
|------------|-----------------------------|

Drain Line Flow Controls

| | |
|-----------------|-----------------------------|
| 60705-00 | DLFC, Plastic, Blank |
| 60705-06 | DLFC, Plastic, .60 GPM |
| 60705-08 | DLFC, Plastic, .80 GPM |
| 60705-10 | DLFC, Plastic, 1.0 GPM |
| 60705-12 | DLFC, Plastic, 1.2 GPM |
| 60705-13 | DLFC, Plastic, 1.3 GPM |
| 60705-15 | DLFC, Plastic, 1.5 GPM |
| 60705-17 | DLFC, Plastic, 1.7 GPM |
| 60705-20 | DLFC, Plastic, 2.0 GPM |
| 60705-24 | DLFC, Plastic, 2.4 GPM |
| 60705-30 | DLFC, Plastic, 3.0 GPM |
| 60705-35 | DLFC, Plastic, 3.5 GPM |
| 60705-40 | DLFC, Plastic, 4.0 GPM |
| 60705-45 | DLFC, Plastic, 4.5 GPM |
| 60705-50 | DLFC, Plastic, 5.0 GPM |
| 60705-60 | DLFC, Plastic, 6.0 GPM |
| 60705-70 | DLFC, Plastic, 7.0 GPM |
| 60705-8.0 | DLFC, QC x 3/4" F, 8.0 GPM |
| 60705-9.0 | DLFC, QC x 3/4" F, 9.0 GPM |
| 60705-12 | DLFC, QC x 3/4" F, 12.0 GPM |
| 60705-15 | DLFC, QC x 3/4" F, 15.0 GPM |

Drives

| | |
|----------------|--------------------------------------|
| 60050-21 | Drive Assy, 2750, STF, 120V Softener |
|----------------|--------------------------------------|

Injectors

| | |
|---------------|--|
| 60480-xx..... | 1600 Injector Assy (Specify size of Injector) |
|---------------|--|

Meters

| | |
|-----------------|---|
| 60088-180 | Meter Assy, 3/4" Dual Port, Slip Std, Rt Ang/180 Plastic Paddle w/clps |
| 60089-180 | Meter Assy, 3/4" Dual Port, Slip Ext, Rt Ang/180 Plastic Paddle w/clps |

Pistons

| | |
|----------------|--|
| 61670-00 | Piston Assy w/ Seal & Spacer Kit 2510 Piston |
| 61670-01 | Piston Assy w/Seal & Spacer Kit 2510 Piston NHWBP |
| 61671-00 | Piston Conversion w/Seal & Spacer 2510 NHWBP Filter |
| 61671-01 | Piston Conversion w/Seal & SPacer 2510 NHWBP 1600 |

Program Wheels

| | |
|----------------|---|
| 60405-10 | Program Wheel, w/3/4" Std Label Set @ 21 |
| 60405-15 | Program Wheel, w/3/4" Std Label w/ People Label Set @ 21 |

Safety Brine (2300)

| | |
|----------------|---|
| 60028-30 | Float Assy, 2350, 30", White |
| 60027-FFA..... | Safety Brine Valve Body, 2300 Fitting Facing Arm |
| 60027-FFS..... | Safety Brine Valve Body, Fitting Facing Stud |

Sales and Service Aids

| | |
|------------|------------------------------|
| 40097..... | Literature, 2510, S/Manual |
| 16510..... | Literature, 2510, Spec Sheet |

Seal & Spacer Kits

| | |
|----------------|----------------------------------|
| 60129..... | Seal & Spacer Kit, 2850 |
| 60129-20 | Seal & Spacer Kit, 2850, Natural |
| 60129-30 | Seal & Spacer Kit, 2850 |

Skipper Wheels

| | |
|------------|----------------------------|
| 14860..... | Skipper Wheel Assy, 7 Day |
| 14381..... | Skipper Wheel Assy, 12 Day |

Yokess

| | |
|----------------|--|
| 13708-40 | Yoke, 1", Sweat |
| 13708-45 | Yoke, 3/4", Sweat |
| 18706..... | Yoke, 1", NPT, Plastic |
| 18706-20 | Yoke, 3/4", NPT, Plastic |
| 19275..... | Yoke, Angle 90 Deg. 3/4", NPT |
| 19275-45 | Yoke, Angle 90 Deg. 3/4" Sweat |
| 19620-01 | Yoke Assy, 3/4", R/Angle, 90 Deg w/O- rings, Clips and Screws |
| 40636..... | Yoke, 1-1/4", NPT |
| 40636-49 | Yoke, 1-1/4", Sweat |
| 41026-01 | Yoke, 1", NPT, SS |
| 41027-01 | Yoke, 3/4", NPT, Cast, Machd |

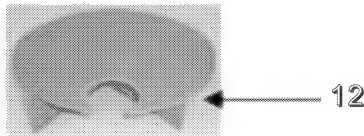
Iron Guard and Iron Guard Plus



| Part No. CDN | Part No. USA | Model Description | Distributor (1) | Valve (3) | Tank (4) | Lid (5) | Brine Tank (6) | Grid (12) | Media Bed |
|-----------------|-----------------|----------------------|--------------------|--------------|-------------|------------|-------------------|--------------|--------------|
| 2060 | 2060-4 | FE30MI | 19807 | 2510-92 | 110474 | NA | 100192 | 19709 | 95405 |
| 2059 | 2059-4 | FE45MI | 19806 | 2510-100 | 112524 | NA | 100192 | 95009-21 | 95407 |
| 2058 | 2058-4 | FE60MI | 19806 | 2510-99 | 114506 | NA | 100192 | 19706 | Call |
| 2061 | 2061-4 | STFE30MI | 19806 | 2510-92 | 110544 | NA | 100192 | 19709 | Call |

Common Components

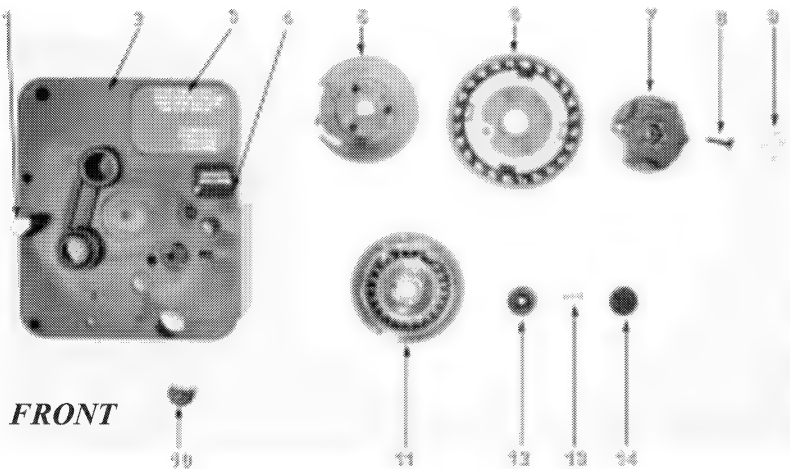
| Item No. | Part No. | Description |
|----------|-------------|-------------------|
| 2 | 19291 - 020 | Cover |
| 7 | 48004 | Brine Well Cap |
| 9 | 13308 | Hose, Barb |
| 10 | 60088 - 180 | Meter, 180 Degree |
| 11 | 60049 | Bypass |
| 8 | 13624 | Safety Float |



Units 2058 include a CPVC tank adapter – Part No. 81041

Note: All USA units come standard with #60040SS - Stainless Steel Bypass.

2510 Meter Initiated Valve - 3210 Timer Assembly

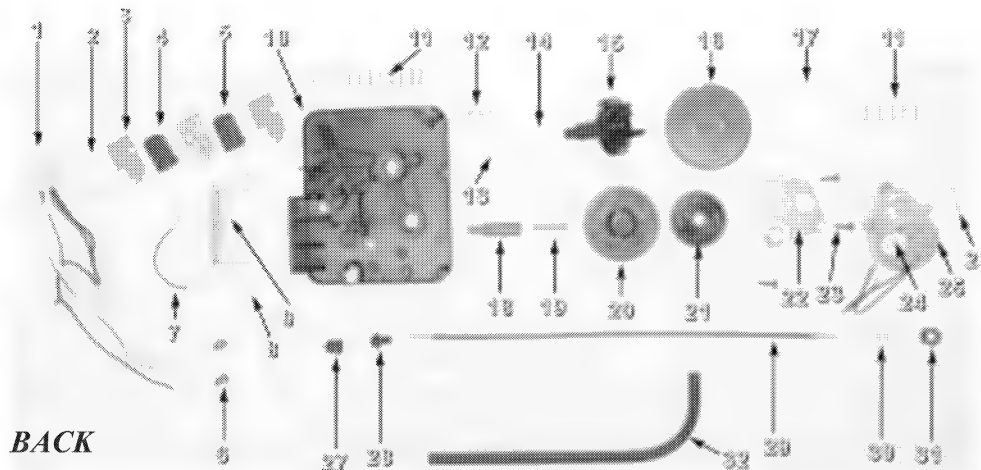


FRONT

| Item No. | Qty Req'd | Part No. | Description |
|----------|-----------|----------|-------------------------|
| 1 | 1 | 14007 | Time Of Day Label |
| 2 | 1 | 13870 | Timer Housing |
| 3 | 1 | 14045 | Instruction Timer Label |

3210 MI Timer Assembly - FRONT

| Item No. | Qty Req'd | Part No. | Description |
|----------|-----------|----------|--------------------------|
| 4 | 1 | 14198 | Indicator Label |
| 5 | 1 | 13802 | Cycle Actuator Gear |
| 6 | 1 | 13973 | 24 Hour Gear Assembly |
| | 1 | 13009 | 24 Hour Gear |
| | 1 | 13956 | 24 Hour Label |
| 7 | 1 | 13886 | Timer Knob |
| 8 | 1 | 13296 | Mounting Screw |
| 9 | 1 | 11999 | Button Timer Label |
| 10 | 1 | 14252 | Outboard Bearing Cap |
| 11 | 1 | 14039 | Program Wheel Assembly |
| | 1 | 13803 | Program Drive Wheel Gear |
| | 1 | 13885 | Program Wheel Cover |
| | 1 | 15956 | Program Wheel Adj Disc |
| | 1 | 15967 | Gallons Label |
| | 2 | 13898 | Screws |
| 12 | 1 | 13806 | Program Wheel Retainer |
| 13 | 1 | 13748 | Screw |
| 14 | 1 | 13953 | Program Wheel Label |

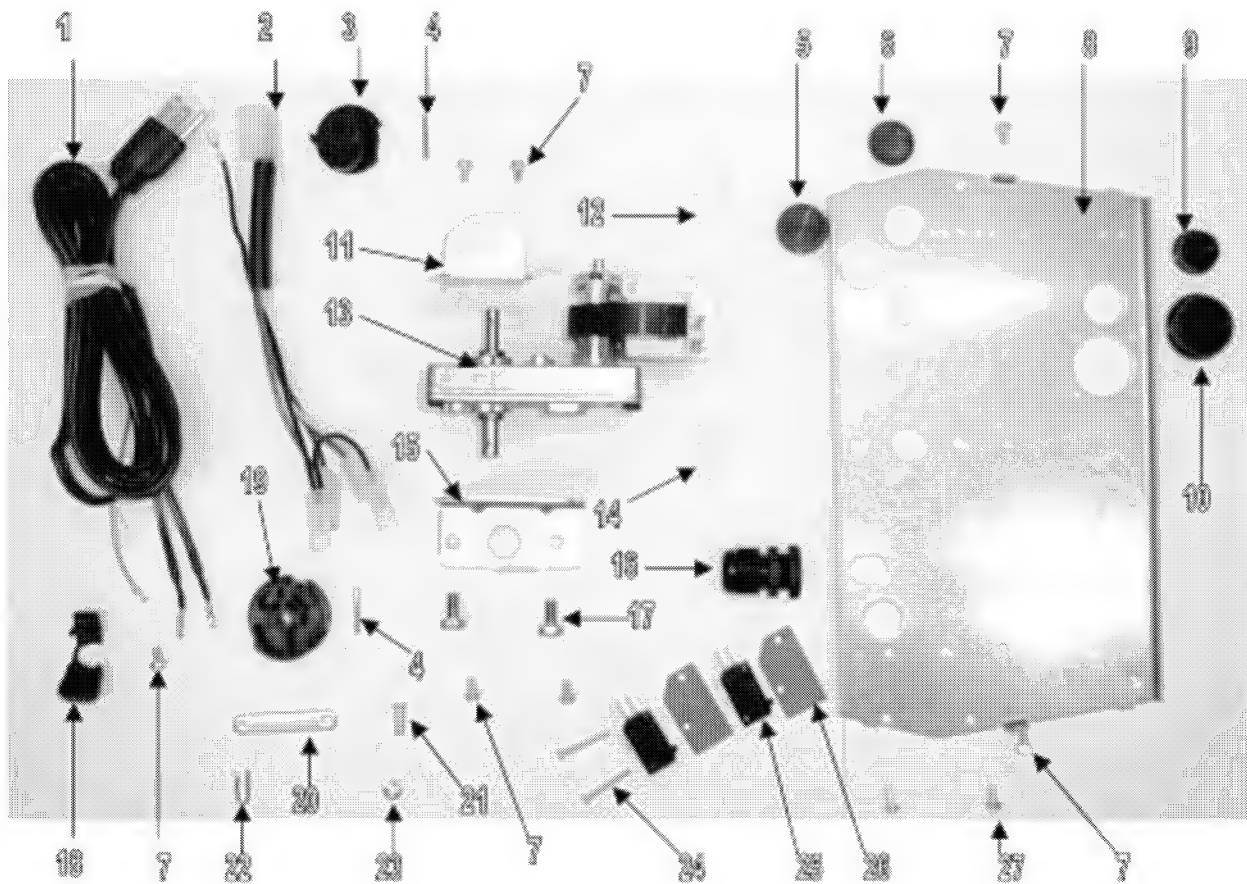


BACK

3210MI Timer Assembly - BACK

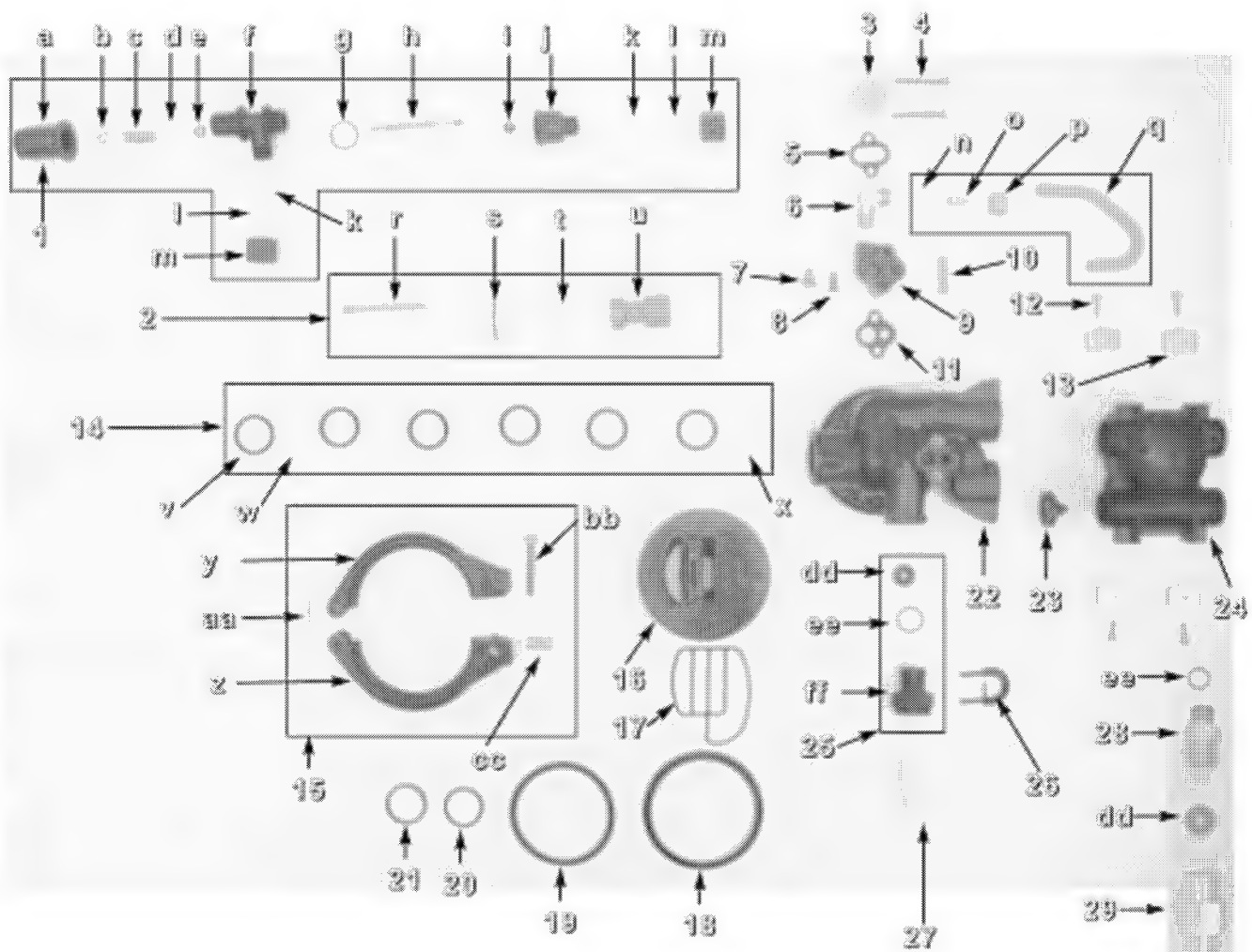
| Item No. | Qty Req'd | Part No. | Description | Item No. | Qty Req'd | Part No. | Description |
|----------|-----------|----------|-------------------------------|----------|-----------|----------|----------------------------|
| 1 | 1 | 13902 | Wire Harness | 17 | 1 | 13901 | Program Wheel Label |
| 2 | 2 | 11413 | Screw | 18 | 1 | 13018 | Idler Pinion |
| 3 | 3 | 14087 | Insulator | 19 | 1 | 13312 | Idler Shaft Spring |
| 4 | 1 | 15320 | Micro Switch (White Lever) | 20 | 1 | 13017 | Idler Gear |
| 5 | 1 | 10896 | Micro Switch (1/2 Moon Lever) | 21 | 1 | 13164 | Drive Gear |
| 6 | 2 | 18612 | Blue Wire Nut | 22 | 1 | 13887 | Motor Mounting Plate |
| 7 | 1 | 15354-01 | Green Ground Wire | 23 | 3 | 13296 | Screws |
| 8 | 3 | 11384 | Screw | 24 | 1 | 18743 | Drive Motor, 120 V |
| 9 | 1 | 13881 | Hinge Bracket | 25 | 1 | 14102 | Motor Label |
| 10 | 1 | 13870 | Timer Housing | 26 | 2 | 13278 | Screws |
| 11 | 16 | 15493 | Spring Pin | 27 | 1 | 13830 | Program Wheel Drive Pinion |
| 12 | 1 | 14265 | Spring Clip | 28 | 1 | 13831 | Drive Pinion Clutch |
| 13 | 1 | 14457 | Spring | 29 | 1 | 14730 | Meter Cable |
| 14 | 1 | 15066 | 1/4" Delrin Ball | 30 | 1 | 14276 | Meter Clutch Spring |
| 15 | 1 | 13911 | Main Drive Gear | 31 | 1 | 14253 | Clutch Spring Retainer |
| 16 | 1 | 13880 | Program Wheel | 32 | 1 | 15307 | Meter Cable Guide |

2510 Meter Initiated Valve - Power Head Assembly



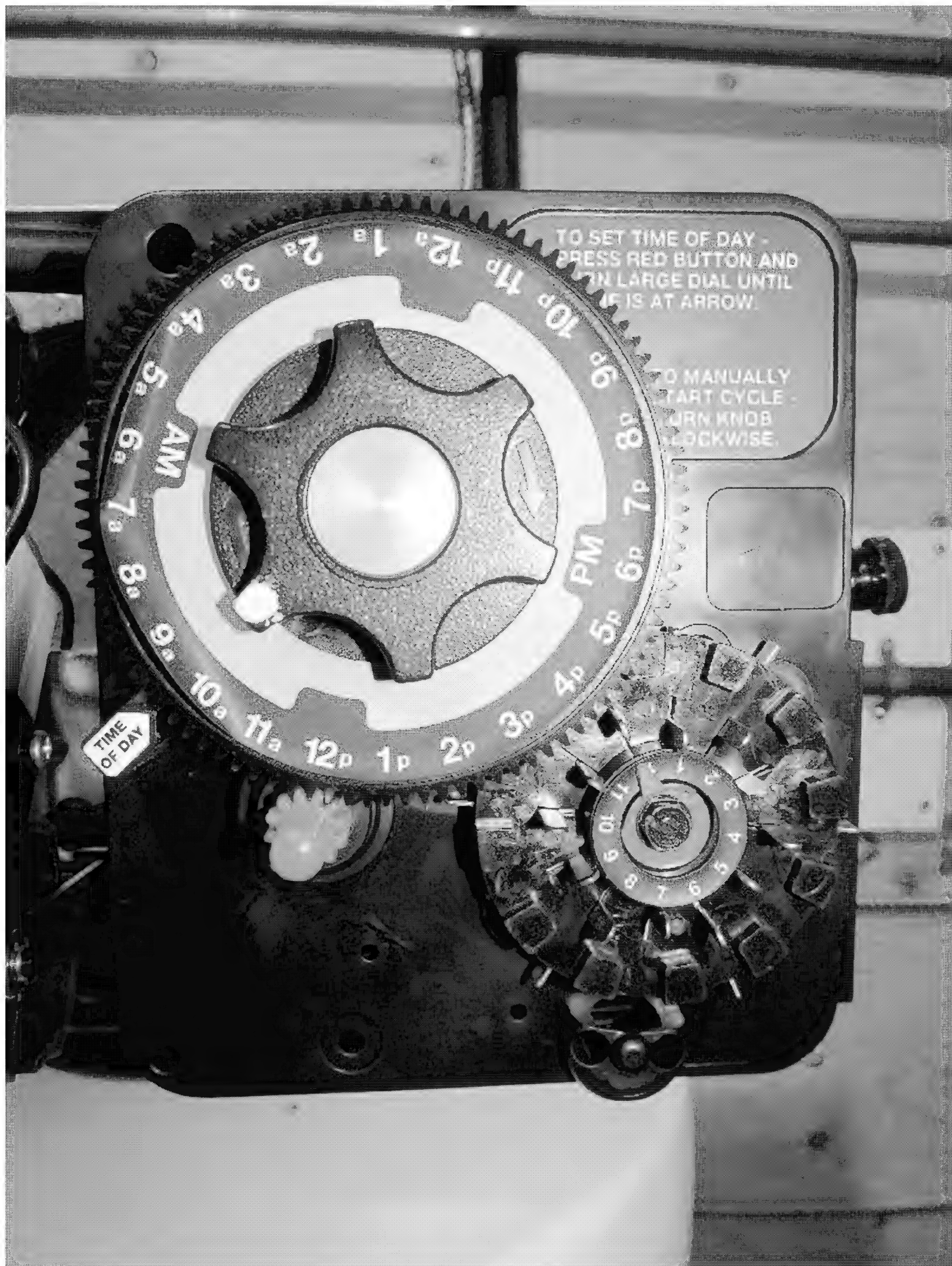
| Item # | Qty. Req'd | Part # | Description | Item # | Qty. Req'd | Part # | Description |
|--------|---------------|-----------|--------------------|--------|---------------|--------|-------------------------|
| 1 | 1 | 11838 | Power Cord | 15 | 1 | 10774 | Drive Side Bracket |
| 2 | 1 | 11667 | Wire Harness | 16 | 2 | 17967 | Liquid Tight Fitting |
| 3 | 1 | 12777 | Brine Valve Cam | 17 | 1 | 10231 | Screws |
| 4 | 2 | 10338 | Roll Pin | 18 | 1 | 13547 | Strain Relief |
| 5 | 1 | 16493 | Plug | 19 | 1 | 12576 | Drive Cam |
| 6 | 2 | 13741 | Plug | 20 | 1 | 10621 | Link |
| 7 | 7 | 10872 | Screws | 21 | 1 | 13366 | Drive Bearing |
| 8 | 1 | 40264 | Back Plate | 22 | 1 | 10909 | Connecting Rod Pin |
| 9 | 1 | 15806 | Plug | 23 | 1 | 10250 | Retaining Ring |
| 10 | 1 | 17421 | Plug | 24 | 2 | 14923 | Screws |
| 11 | 1 | 11826 | Motor Bracket | 25 | 2 | 10218 | Micro Switch (No Lever) |
| 12 | 1 | 28414 - 2 | K | 26 | 2 | 10302 | Insulator |
| 13 | 1 | 10769 | Drive Motor, 110 V | 27 | 2 | 10300 | Screws |
| 14 | 1 | 28414 - 1 | M | | | | |

2510 Meter Initiated Control Valve Assembly



2510 Meter Initiated Control Valve Assembly

| Item No. | Qty | Part No. | Description | Item No. | Qty | Part No. | Description |
|----------|----------|--------------|--|-----------|----------|------------------|--------------------------------|
| 1 | 1 | 60029 | Brine Valve, 1600 , Brass, No Refill | 14 | 1 | 13812 | Seal & Spacer Kit |
| | | 60011-50 | Brine Valve, 1650, Noryl, 0.5 gpm Refill | v | 6 | 10545 | Piston Seal |
| | | 60011-00 | Brine Valve, 1650 Noryl, No Refill | w | 5 | 11451 | Spacers |
| a | 1 | 17906 | Stem Guide | x | 1 | 10757 | End Spacer |
| b | 1 | 10250 | Retaining Ring | 15 | 1 | P60503 | 2510 Clamp Ring Assy |
| c | 1 | 10249 | Brine Valve Spring | y | 1 | 19900 | Male Clamp |
| d | 1 | 17908 | Stem Sleeve | z | 1 | 19899 | Female Clamp |
| e | 1 | 12550 | Quad Ring | aa | 1 | 040000 | Hinge Pin |
| f | 1 | 17905 | Brine Valve Body | bb | 1 | 40057 | Clamp Screw |
| g | 1 | 16924 | O - Ring | cc | 1 | 19998 | Clamp Pivot |
| h | 1 | 12552 | Brine Valve Stem | 16 | 1 | 19322 | Adapter Base |
| i | 1 | 12626 | Brine Valve Seat | 17 | 1 | 19936 | Base Adapter Seal |
| j | 1 | 17907 | Flow Control Fitting | 18 | 1 | 19197 | Slip Ring |
| k | 2 | 19624 | GFN Nut Sleeve | 19 | 1 | 18303 | O - Ring |
| l | 2 | 19623 | GFN Nut Gripper | 20 | 1 | 13304 | O - Ring |
| m | 2 | 19321 | Nut | 21 | 1 | 13030 | Dist. Tube Retainer |
| n | 1 | 10330 | 3/8" Delrin Sleeve | 22 | 1 | 19328 | 2510 Valve Body |
| o | 1 | 10332 | 3/8" Insert | 23 | 1 | No Part # | Flow Straightener |
| p | 1 | 10329 | 3/8" Fitting Nut | 24 | 1 | 60088-180 | 180 Degree Meter |
| q | 1 | 40027 | Brine Valve Tube | 25 | 1 | 13615 | Cont. Backwash 3.5 Assy |
| 2 | 1 | 13811 | Piston Assembly | | 1 | 13616A | Cont. Backwash 5.0 Assy |
| r | 1 | 14452 | Piston Rod | | 1 | 13617 | Cont. Backwash 7.0 Assy |
| s | 1 | 10598 | End Plug Assembly | | 1 | 60760-101 | Control DLF 10 GPM |
| t | 1 | 14309 | Piston Rod Retainer | | | | (Shown Separately) |
| u | 1 | 15168 | Piston | dd | 1 | 12090 | 3.50 GPM Washer |
| 3 | 1 | 11893 | Flat Injector Cap | | 1 | 12092 | 5.00 GPM Washer |
| 4 | 2 | 10692 | Screws | | 1 | 12408 | 7.00 GPM Washer |
| 5 | 1 | 10229 | Injector Cover Gasket | | 1 | 16529 | 10.00 GPM Washer |
| 6 | 1 | 10328 | 90 Degree Tube Fitting | ee | 1 | 11183 | O - Ring |
| 7 | 1 | 12973 - 2 | PVC Nozzle | ff | 1 | 11385 - 01 | Flow Control Housing |
| 8 | 1 | 12974 - 2 | PVC Throat | 26 | 1 | 18312 | Retainer Clip |
| 9 | 1 | 17776 | Injector Body | 27 | 1 | 12338 | 90 Degree Hose Barb |
| 10 | 1 | 10227 | Injector Screen | 28 | 1 | 11912 | Drain Line Fitting |
| 11 | 1 | 11475 | Body Gasket | 29 | 1 | 019480 | Drain Line Housing |
| 12 | 4 | 13314 | Screws | | | | |
| 13 | 4 | 13255 | Mounting Clip | | | | |



CDA 30-1TD-2TX

C/W 2 GPM BW, 1 GPM REFILL
#1 INJECTOR, & BYPASS
C/W SST 60 RESIN/RESUP FEEDER
PART # 95001010 B5
ORDER 6075 EMCO MEDICINE HAT
EMCO PO 7739069-00

60500700
VALVE 9100 XT

ITEM NUMBER

95001010



DESCRIPTION

SOFTENER CDA 30
.1PTD-2TX SST60 RESIN 9100XT C/W SF BT

VALVE 1 OF 4

G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W

MASTER PROGRAMMING MODE CHART CD-30

Caution: Before entering Master Programming, please contact your local professional water dealer.

9448
 Box 2
 Rensselaer
 NY

| Master Programming Options | | | |
|------------------------------|------------------------|-----------------------------------|--|
| Abbreviation | Parameter | Option Abbreviation | Options |
| DR | Display Format | 12AL | Gallons |
| | | 1 | Liters |
| VT | Valve Type | 0110 | Standard Downflow/Upflow Single Backwash |
| | | 0020 | Standard Downflow/Upflow Double Backwash |
| | | 110 | Filter |
| | | 01-03 | Upflow Baffle Fast |
| | | 8000 | Twini 10100SXT |
| | | 001 | Other |
| CT | Control Type | FD | Meter (Flow) Delayed |
| | | FI | Meter (Flow) Immediate |
| | | 10 | Time Clock |
| | | DAY | Day or Week |
| NT | Number of Tanks | 1 | Single Tank System |
| | | 2 | Two Tank System |
| TS | Tank In Service | U1 | Tank 1 In Service |
| | | U2 | Tank 2 In Service |
| C | Unit Capacity | 26,000 | Unit Capacity (Grains) |
| H | Feedwater Hardness | 15 | Hardness of Inlet Water Section 5.1.2 |
| RS | Reserve Selection | SF | Percentage Safety Factor |
| | | 10 | Fixed Reserve Capacity |
| SF | Safety Factor | 0 | Percentage of the system capacity to be used as a reserve |
| RC | Fixed Reserve Capacity | | Fixed volume to be used as a reserve |
| DO | Day Override | OFF | The system's day override setting |
| RI | Regen Time | | The time or day the system will regenerate |
| SW, SO, RR, RF | Regen Cycle Step Times | 15:10 30:00 32:10 Refill | The time duration for each regeneration step. Adjustable from OFF and 0-195 minutes. NOTE: If "Other" is chosen under "Valve Type", then R1, R2, R3, etc., will be displayed instead. |
| D1, D2, D3, D4, D5, D6, & D7 | Day of Week Settings | | Regeneration setting (On or OFF) for each day of the week on day-of-week systems |
| CD | Current Day | | The Current day of the week |
| FM | Flow Meter Type | 10.7 | 3/4" Turbine Meter |
| | | P07 | 3/4" Paddle Wheel Meter |
| | | 11.0 | 1" Turbine Meter |
| | | P10 | 1" Paddle Wheel Meter |
| | | 11.5 | 1.5" Turbine Meter |
| | | P15 | 1.5" Paddle Wheel Meter |
| | | P20 | 2" Paddle Wheel Meter |
| | | Gen | Generic or Other Meter |
| K | Meter Pulse Setting | | Meter pulses per gallon for generic/other flow meter |

Notes: Some items may not be shown depending on timer configuration. The timer will discard any changes and exit Master Programming Mode if any button is not pressed for sixty seconds.



Commercial



Softeners
Filters
Reverse Osmosis



Industry Leading Support From Start To Finish

NOVO has dedicated Professional Engineers with decades of commercial water treatment experience to compliment our knowledgeable field sales team. Together they provide complete support starting from the water analysis, sizing and selection right through to the installation.

The commercial market is full of opportunities for you to add valuable revenue:

- Laundromats
- Carwashes
- Restaurants
- Hospitals
- Schools
- Hotels
- Office Buildings
- Manufacturing Facilities



Dave Pitman, P.Eng.
Commercial Engineering
Manager

Leading Expertise

Dave Pitman is one of North America's most respected Commercial Water Conditioning Engineers with over 23 years experience.

Toby Hughes has gained invaluable experience over the past 16 years responsible for running some of the largest water treatment manufacturing facilities in the world.



Toby Hughes, P.Eng.
EVP Operations



Commercial Capabilities

PRODUCT LINE

Novo offers a complete line of Commercial Water Treatment Products:

- Water Softeners
- Filters
- Chemical Feed Systems
- Ultraviolet Disinfection Systems
- Reverse Osmosis Units
- Dealkalizers
- Nitrate Reduction

WATER SOFTENERS

Novo offers two standard lines of softeners: 1) CAS Series and 2) CDA Series. Both lines use proven piston, seal and spacer valve technology with electronic controllers and fiberglass tanks.

1) CAS Series

- Sizes range from 10" to 63" in diameter with resin volumes from 1.5 ft³ to 58 ft³ per tank
- Available as single, duplex, triplex and quadraplex systems

2) CDA Series

- Sizes range from 9" to 24" in diameter with resin volumes from 1.0 ft³ to 10 ft³ per tank
- Available as duplex alternating units only (service / standby)

WATER FILTERS

Novo offers several standard lines of filters. Standard feature include proven piston, seal and spacer valve technology with electronic controllers and fiberglass tanks from 10" to 36" in diameter. Larger filters (42" to 63") available with Aquamatic diaphragm valves. Options includes Clock, Meter or Pressure Differential Initiated. Side mounted control valves (1.5" & 2") and treated water regeneration kits also available.

1) CMG Series - Manganese Greensand

2) CMM Series - Multi-Media

3) CAC Series - Carbon

4) CBF Series - Birm

5) CNF Series - Neutralizing

REVERSE OSMOSIS

Novo offers several reverse osmosis systems from 530 to 38,880 gallons per day.



Commercial Softener Specifications

CDA Series

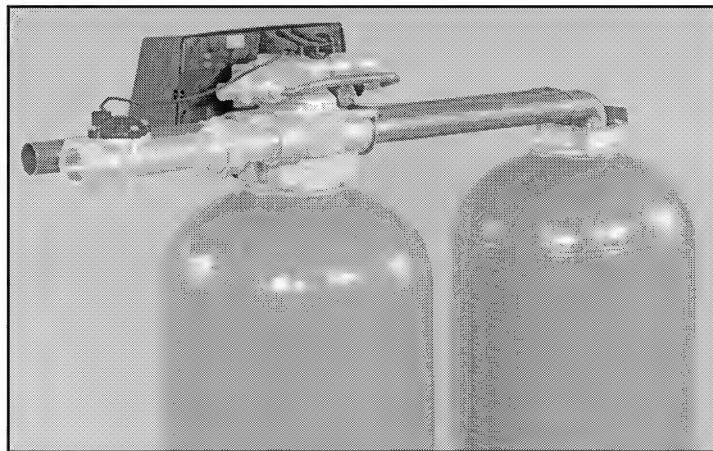
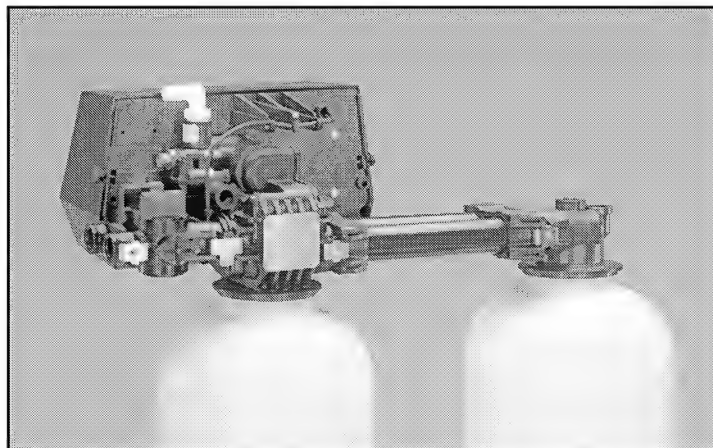
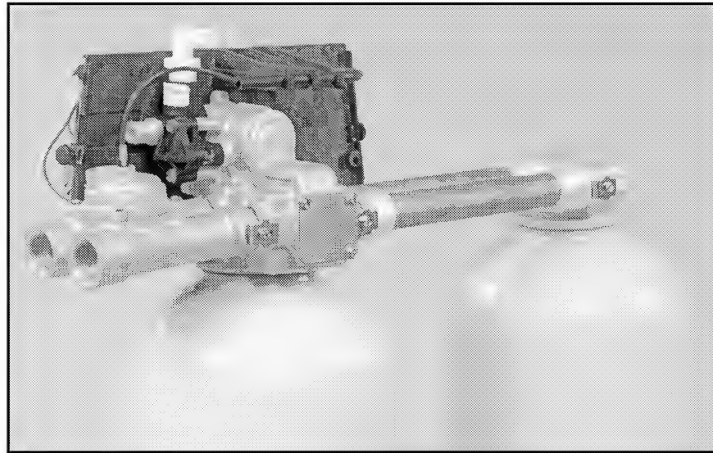
| Model | Capacity | Salt | | Resin | | Critical Flow | Flow Rates | | Max. Flow To Drain | Mineral Tank | | Brine Tank | | System Dimensions | | |
|------------------|----------|-------------|------|------------|------|---------------|------------|----------|--------------------|--------------|------|------------|------|-------------------|-------|-------|
| | | @15 lbs/Ft3 | Kg | Ft3 | M3 | | @ 15 PSI | @ 25 PSI | | In | Side | Diameter | Side | Height | Depth | Width |
| | | @10 lbs/Ft3 | Kg | (Per Tank) | L/S | | USGPM | USGPM | | mm | mm | mm | mm | mm | mm | mm |
| CDA 30-3/4 or 1 | 30,000 | 15 | 6.8 | 1 | 5 | 12 | 17 | 2 | 9 | 48 | 16 | 32 | 58 | 22 | 43 | |
| | 27,000 | 10 | 4.5 | 0.03 | 0.32 | 0.76 | 1.07 | 0.13 | 229 | 1219 | 406 | 813 | 1473 | 559 | 1092 | |
| CDA 40-3/4 or 1 | 39,900 | 20 | 9.1 | 1.33 | 7 | 13 | 18 | 2.4 | 10 | 54 | 16 | 32 | 65 | 22 | 45 | |
| | 35,910 | 13 | 6.0 | 0.04 | 0.42 | 0.82 | 1.14 | 0.15 | 254 | 1372 | 406 | 813 | 1651 | 559 | 1143 | |
| CDA 45-3/4 or 1 | 45,000 | 22.5 | 10.2 | 1.5 | 7.5 | 13 | 18 | 2.4 | 10 | 54 | 16 | 32 | 65 | 22 | 45 | |
| | 40,500 | 15 | 6.8 | 0.04 | 0.47 | 0.82 | 1.14 | 0.15 | 254 | 1372 | 406 | 813 | 1651 | 559 | 1143 | |
| CDA 50-3/4 or 1 | 50,100 | 25 | 11.4 | 1.67 | 8 | 15 | 21 | 4 | 12 | 52 | 20 | 37 | 65 | 26 | 53 | |
| | 45,090 | 17 | 7.6 | 0.05 | 0.53 | 0.95 | 1.32 | 0.25 | 305 | 1321 | 508 | 940 | 1651 | 660 | 1346 | |
| CDA 60-3/4 or 1 | 60,000 | 30 | 13.6 | 2 | 10 | 15 | 20 | 4 | 12 | 52 | 20 | 37 | 63 | 26 | 53 | |
| | 54,000 | 20 | 9.1 | 0.06 | 0.63 | 0.95 | 1.26 | 0.25 | 305 | 1321 | 508 | 940 | 1600 | 660 | 1346 | |
| CDA 90-3/4 or 1 | 90,000 | 45 | 20.5 | 3 | 15 | 15 | 21 | 5 | 14 | 65 | 24 | 37 | 76 | 30 | 61 | |
| | 81,000 | 30 | 13.6 | 0.08 | 0.95 | 0.95 | 1.32 | 0.32 | 356 | 1651 | 610 | 940 | 1930 | 762 | 1549 | |
| CDA 120-3/4 or 1 | 120,000 | 60 | 27.3 | 4 | 16 | 16 | 21 | 7 | 16 | 65 | 24 | 37 | 76 | 30 | 65 | |
| | 108,000 | 40 | 18.2 | 0.11 | 1.01 | 1.01 | 1.32 | 0.44 | 406 | 1651 | 610 | 940 | 1930 | 762 | 1651 | |
| CDA 60-1.5 | 60,000 | 30 | 13.6 | 2 | 10 | 28 | 39 | 5 | 14 | 65 | 20 | 37 | 76 | 26 | 57 | |
| | 54,000 | 20 | 9.1 | 0.06 | 0.63 | 1.77 | 2.46 | 0.32 | 356 | 1651 | 508 | 940 | 1930 | 660 | 1448 | |
| CDA 90-1.5 | 90,000 | 45 | 20.5 | 3 | 15 | 25 | 35 | 5 | 14 | 65 | 24 | 37 | 76 | 30 | 61 | |
| | 81,000 | 30 | 13.6 | 0.08 | 0.95 | 1.58 | 2.21 | 0.32 | 356 | 1651 | 610 | 940 | 1930 | 762 | 1549 | |
| CDA 120-1.5 | 120,000 | 60 | 27.3 | 4 | 20 | 27 | 38 | 7 | 16 | 65 | 24 | 37 | 76 | 30 | 65 | |
| | 108,000 | 40 | 18.2 | 0.11 | 1.26 | 1.70 | 2.40 | 0.44 | 406 | 1651 | 610 | 940 | 1930 | 762 | 1651 | |
| CDA 150-1.5 | 150,000 | 75 | 34.1 | 5 | 25 | 33 | 44 | 12 | 21 | 62 | 24 | 48 | 78 | 30 | 75 | |
| | 135,000 | 50 | 22.7 | 0.14 | 1.58 | 2.08 | 2.78 | 0.76 | 533 | 1575 | 610 | 1219 | 1981 | 762 | 1905 | |
| CDA 180-1.5 | 180,000 | 90 | 40.9 | 6 | 30 | 32 | 43 | 12 | 21 | 62 | 24 | 48 | 78 | 30 | 75 | |
| | 162,000 | 60 | 27.3 | 0.17 | 1.89 | 2.02 | 2.71 | 0.76 | 533 | 1575 | 610 | 1219 | 1981 | 762 | 1905 | |
| CDA 210-1.5 | 210,000 | 105 | 47.7 | 7 | 31 | 31 | 42 | 12 | 21 | 62 | 24 | 48 | 78 | 30 | 75 | |
| | 189,000 | 70 | 31.8 | 0.20 | 1.96 | 1.96 | 2.65 | 0.76 | 533 | 1575 | 610 | 1219 | 1981 | 762 | 1905 | |
| CDA 270-1.5 | 270,000 | 135 | 61.4 | 9 | 32 | 32 | 44 | 15 | 24 | 72 | 30 | 48 | 86 | 36 | 87 | |
| | 243,000 | 90 | 40.9 | 0.25 | 2.02 | 2.02 | 2.78 | 0.95 | 610 | 1829 | 762 | 1219 | 2184 | 914 | 2210 | |
| CDA 300-1.5 | 300,000 | 150 | 68.2 | 10 | 32 | 32 | 43 | 15 | 24 | 72 | 30 | 48 | 86 | 36 | 87 | |
| | 270,000 | 100 | 45.5 | 0.28 | 2.02 | 2.02 | 2.71 | 0.95 | 610 | 1829 | 762 | 1219 | 2184 | 914 | 2210 | |

CAS Series

| Model | Capacity | Resin | Salt | | Critical | 1" | | 1.5" | | 2" | | 2.0" | | 3" | | Max Flow | Dimensions | |
|----------|-------------|-----------------|-------------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|------------|-----------|
| | @15 lbs/Ft3 | M ³ | @15 lbs/Ft3 | @10 lbs/Ft3 | Flow | @ 15 PSI | @ 25 PSI | @ 15 PSI | @ 25 PSI | @ 15 PSI | @ 25 PSI | @ 15 PSI | @ 25 PSI | @ 15 PSI | @ 25 PSI | To Drain | Mineral | Brine |
| | @10 lbs/Ft3 | Ft ³ | Kg | Kg | USGPM | USGPM | USGPM | USGPM | USGPM | USGPM | USGPM | USGPM | USGPM | USGPM | USGPM | USGPM | Tank | Tank |
| CAS 45 | 45000 | 1.5 | 23 | 15 | 7.5 | 15 | 21 | | | | | | | | | 1/5 | 10x54 | 20" x 37" |
| | 40500 | 0.04 | 10.2 | 6.8 | 0.47 | 0.95 | 1.32 | | | | | | | | | 0.15 | 254x1372 | 508x940 |
| CAS 60 | 60000 | 2 | 30 | 20 | 10 | 21 | 28 | 37 | 51 | 49 | 68 | | | | | 5 | 14x65 | 20" x 37" |
| | 54000 | 0.06 | 13.6 | 9.1 | 0.63 | 1.32 | 1.77 | 2.33 | 3.22 | 3.09 | 4.29 | | | | | 0.32 | 356x1651 | 508x940 |
| CAS 90 | 90000 | 3 | 45 | 30 | 15 | 19 | 26 | 32 | 45 | 39 | 56 | | | | | 5 | 14x65 | 24" x 37" |
| | 81000 | 0.08 | 20.5 | 13.6 | 0.95 | 1.20 | 1.64 | 2.02 | 2.84 | 2.46 | 3.53 | | | | | 0.32 | 356x1651 | 610x940 |
| CAS 120 | 120000 | 4 | 60 | 40 | 20 | 20 | 27 | 36 | 51 | 46 | 65 | | | | | 7 | 16x65 | 24" x 37" |
| | 108000 | 0.11 | 27.3 | 18.2 | 1.26 | 1.26 | 1.70 | 2.27 | 3.22 | 2.90 | 4.10 | | | | | 0.44 | 403x1651 | 610x940 |
| CAS 150 | 150000 | 5 | 75 | 50 | 25 | 23 | 30 | 46 | 62 | 68 | 95 | | | | | 12 | 21x62 | 24" x 48" |
| | 135000 | 0.14 | 34.1 | 22.7 | 1.58 | 1.45 | 1.89 | 2.90 | 3.91 | 4.29 | 5.99 | | | | | 0.76 | 533x1575 | 610x1220 |
| CAS 180 | 180000 | 6 | 90 | 60 | 30 | 22 | 30 | 45 | 60 | 65 | 91 | | | | | 12 | 21x62 | 24" x 48" |
| | 162000 | 0.17 | 40.9 | 27.3 | 1.89 | 1.39 | 1.89 | 2.84 | 3.79 | 4.10 | 5.74 | | | | | 0.76 | 533x1575 | 610x1220 |
| CAS 210 | 210000 | 7 | 105 | 70 | 35 | 22 | 29 | 43 | 59 | 61 | 86 | | | | | 12 | 21x62 | 24" x 48" |
| | 189000 | 0.20 | 47.7 | 31.8 | 2.21 | 1.39 | 1.83 | 2.71 | 3.72 | 3.85 | 5.43 | | | | | 0.76 | 533x1575 | 610x1220 |
| CAS 270 | 270000 | 9 | 135 | 90 | 45 | 23 | 30 | 46 | 62 | 68 | 96 | | | | | 15 | 24x72 | 30" x 48" |
| | 243000 | 0.25 | 61.4 | 40.9 | 2.84 | 1.45 | 1.89 | 2.90 | 3.91 | 4.29 | 6.06 | | | | | 0.95 | 610x1829 | 762x1220 |
| CAS 300 | 300000 | 10 | 150 | 100 | 50 | 22 | 30 | 45 | 61 | 66 | 94 | | | | | 15 | 24x72 | 30" x 48" |
| | 270000 | 0.28 | 68.2 | 45.5 | 3.15 | 1.39 | 1.89 | 2.84 | 3.85 | 4.16 | 5.93 | | | | | 0.95 | 610x1829 | 762x1220 |
| CAS 360 | 360000 | 12 | 180 | 120 | 60 | | | 50 | 66 | 79 | 107 | 73 | 100 | 145 | 199 | 25 | 30x72 | 30" x 48" |
| | 324000 | 0.34 | 81.8 | 54.5 | 3.79 | | | 3.15 | 4.16 | 4.98 | 6.75 | 4.61 | 6.31 | 9.15 | 12.55 | 1.58 | 762x1829 | 762x1220 |
| CAS 390 | 390000 | 13 | 195 | 130 | 65 | | | 50 | 66 | 78 | 106 | 73 | 99 | 141 | 196 | 25 | 30x72 | 30" x 48" |
| | 351000 | 0.37 | 88.6 | 59.1 | 4.10 | | | 3.15 | 4.16 | 4.92 | 6.69 | 4.61 | 6.25 | 8.90 | 12.37 | 1.58 | 762x1829 | 762x1220 |
| CAS 450 | 450000 | 15 | 225 | 150 | 75 | | | 50 | 66 | 76 | 103 | 71 | 98 | 132 | 188 | 25 | 30x72 | 36" x 48" |
| | 405000 | 0.42 | 102.3 | 68.2 | 4.73 | | | 3.15 | 4.16 | 4.79 | 6.50 | 4.48 | 6.18 | 8.33 | 11.86 | 1.58 | 762x1829 | 915x1220 |
| CAS 510 | 510000 | 17 | 255 | 170 | 85 | | | 49 | 64 | 73 | 101 | 70 | 95 | 127 | 181 | 25 | 30x72 | 36" x 48" |
| | 459000 | 0.48 | 115.9 | 77.3 | 5.36 | | | 3.09 | 4.04 | 4.61 | 6.37 | 4.42 | 5.99 | 8.01 | 11.42 | 1.58 | 762x1829 | 915x1220 |
| CAS 570 | 570000 | 19 | 285 | 190 | 95 | | | 52 | 68 | 83 | 111 | 77 | 104 | 162 | 219 | 35 | 36x72 | 36" x 48" |
| | 513000 | 0.54 | 129.5 | 86.4 | 5.99 | | | 3.28 | 4.29 | 5.24 | 7.00 | 4.86 | 6.56 | 10.22 | 13.82 | 2.21 | 915x1829 | 915x1220 |
| CAS 600 | 600000 | 20 | 300 | 200 | 100 | | | 51 | 68 | 83 | 111 | 77 | 103 | 160 | 218 | 35 | 36x72 | 36" x 48" |
| | 540000 | 0.57 | 136.4 | 90.9 | 6.31 | | | 3.22 | 4.29 | 5.24 | 7.00 | 4.86 | 6.50 | 10.09 | 13.75 | 2.21 | 915x1829 | 915x1220 |
| CAS 630 | 630000 | 21 | 315 | 210 | 105 | | | 51 | 67 | 82 | 110 | 76 | 103 | 157 | 215 | 35 | 36x72 | 36" x 48" |
| | 567000 | 0.59 | 143.2 | 95.5 | 6.62 | | | 3.22 | 4.23 | 5.17 | 6.94 | 4.79 | 6.50 | 9.91 | 13.56 | 2.21 | 915x1829 | 915x1220 |
| CAS 660 | 660000 | 22 | 330 | 220 | 110 | | | | | | | 80 | 107 | 182 | 241 | 45 | 42x72 | 42" x 60" |
| | 594000 | 0.62 | 150.0 | 100.0 | 6.94 | | | | | | | 5.05 | 6.75 | 11.48 | 15.20 | 2.84 | 1067x1829 | 1067x1524 |
| CAS 720 | 720000 | 24 | 360 | 240 | 120 | | | | | | | 80 | 106 | 178 | 240 | 45 | 42x72 | 42" x 60" |
| | 648000 | 0.68 | 163.6 | 109.1 | 7.57 | | | | | | | 5.05 | 6.69 | 11.23 | 15.14 | 2.84 | 1067x1829 | 1067x1524 |
| CAS 780 | 780000 | 26 | 390 | 260 | 130 | | | | | | | 79 | 106 | 175 | 237 | 45 | 42x72 | 42" x 60" |
| | 702000 | 0.74 | 177.3 | 118.2 | 8.20 | | | | | | | 4.98 | 6.69 | 11.04 | 14.95 | 2.84 | 1067x1829 | 1067x1524 |
| CAS 900 | 900000 | 30 | 450 | 300 | 150 | | | | | | | 82 | 109 | 189 | 251 | 60 | 48x72 | 42" x 60" |
| | 810000 | 0.85 | 204.5 | 136.4 | 9.46 | | | | | | | 5.17 | 6.88 | 11.92 | 15.84 | 3.79 | 1220x1829 | 1067x1524 |
| CAS 1020 | 1020000 | 34 | 510 | 340 | 170 | | | | | | | 81 | 108 | 186 | 248 | 60 | 48x72 | 42" x 60" |
| | 918000 | 0.96 | 231.8 | 154.5 | 10.73 | | | | | | | 5.11 | 6.81 | 11.73 | 15.65 | 3.79 | 1220x1829 | 1067x1524 |
| CAS 1080 | 1080000 | 36 | 540 | 360 | 180 | | | | | | | 81 | 108 | 184 | 246 | 60 | 48x72 | 42" x 60" |
| | 9720000 | 1.02 | 245.5 | 163.6 | 11.36 | | | | | | | 5.11 | 6.81 | 11.61 | 15.52 | 3.79 | 1210x1829 | 1067x1524 |
| CAS 1740 | 1740000 | 58 | 870 | 580 | 290 | | | | | | | 84 | 110 | 199 | 262 | 95 | 63x86 | 70" x 98" |
| | 1565000 | 1.64 | 395.5 | 263.6 | 18.30 | | | | | | | 5.30 | 6.94 | 12.55 | 16.53 | 5.99 | 1600x2185 | 177x9x14" |

Model 9000/9100/9500

Service Manual



IMPORTANT: Fill in Pertinent Information on Page 3 for Future Reference



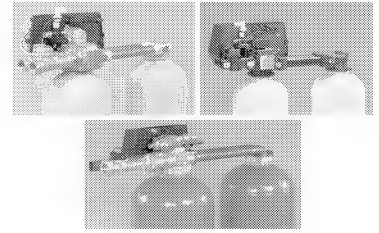
**Pentair
Water**

Fleck Model 9000/9100/9500

Service Manual

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JOB SPECIFICATION SHEET

Job Number: _____
 Model Number: _____
 Water Test: _____
 Capacity Per Unit: _____
 Mineral Tank Size: _____ Diameter: _____ Height: _____
 Brine Tank Size & Salt Setting per Regeneration: _____
 9000/9100/9500 Control Valve Specifications:

1. Type of Timer:

- A. 82 minute available regeneration time, 1/15 RPM
- B. 164 minute available regeneration time, 1/30 RPM

2. Meter Size:

- A. 3/4" Std Range (125 - 2,100 gallon setting)
- B. 3/4" Ext Range (625 - 10,625 gallon setting)
- C. 1" Std Range (310 - 5,270 gallon setting)
- D. 1" Ext Range (1,150 - 26,350 gallon setting)
- E. 1-1/2" Std Range (625 - 10,625 gallon setting)
- F. 1-1/2" Ext Range (3,125 - 53,125 gallon setting)

3. Timer Gallon Setting: _____ Gallons

4. Regeneration Program Setting:

- A. Backwash: _____ Minutes
- B. Brine and Slow Rinse: _____ Minutes
- C. Rapid Rinse: _____ Minutes
- D. Brine Tank Refill: _____ Minutes

5. Drain Line Flow Control: _____ gpm

6. Brine Refill Rate: _____ gpm

7. Injector Size: _____

EQUIPMENT CONFIGURATION

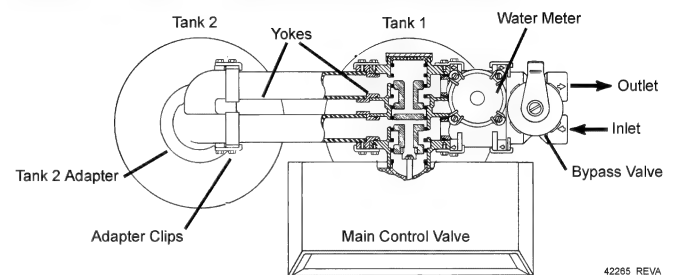


Figure 1 9000/9100 Equipment Configuration

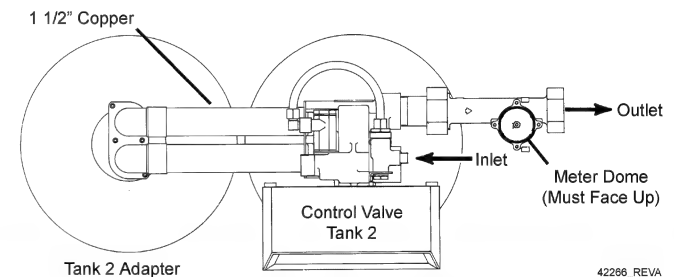


Figure 2 9500 Equipment Configuration

INSTALLATION & START-UP

Water Pressure

A minimum of 25 pounds of water pressure is required for regeneration valve to operate effectively.

Electrical Facilities

A continuous 115 volt, 60 Hertz current supply is required. Make certain the current supply is always hot and cannot be turned off with another switch.

Existing Plumbing

Condition of existing plumbing should be free from lime and iron buildup. Piping that is built up heavily with lime and/or iron should be replaced. If piping is clogged with iron, a separate iron filter unit should be installed ahead of the water softener.

Location Of Softener And Drain

The softener should be located close to a drain.

BY-PASS VALVES

Always provide for the installation of a by-pass valve.

CAUTION Water pressure is not to exceed 125 psi (8.6 bar), water temperature is not to exceed 110°F (43°C), and the unit cannot be subjected to freezing conditions.

1. Place the softener tank where you want to install the unit.

NOTE: Be sure the tank is level and on a firm base.

2. During cold weather it is recommended that the installer warm the valve to room temperature before operating.
3. Perform all plumbing according to local plumbing codes.

- Use a 1/2" minimum pipe size for the drain.
- Use a 3/4" drain line for backwash flow rates that exceed 7 gpm or length that exceeds 20' (6 m).

4. Both tanks must be the same height and diameter and filled with equal amounts of media.
5. The distributor tube must be flush with the top of each tank. Cut if necessary. Use only non-aerosol silicone lubricant.
6. Lubricate the distributor O-ring seal and tank O-ring seal. Place the main control valve on one tank and the tank adapter on the second tank.

NOTE: If required, solder copper tubing for tank interconnection before assembling on the main control valve and tank adapter. Maintain a minimum of 1" distance between tanks on final assembly.

7. Solder joints near the drain must be done before connecting the Drain Line Flow Control fitting (DLFC). Leave at least 6" (152 mm) between the DLFC and solder joints when soldering pipes that are connected on the DLFC. Failure to do this could cause interior damage to DLFC.
8. Use only Teflon tape on the drain fitting.
9. Be sure the floor under the salt storage tank is clean and level.
10. Place approximately 1" (25 mm) of water above the grid plate. If a grid is not utilized, fill to the top of the air check in the salt tank. Do not add salt to the brine tank at this time.
11. On units with a bypass, place in Bypass position.
12. Turn on the main water supply.
13. Open a cold soft water tap nearby and let water run a few minutes or until the system is free of foreign material (usually solder) resulting from the installation. Close the water tap when water runs clean.

2 • NO11 Fleck Model 9000/9100/9500

14. Place the bypass In Service position and let water flow into the mineral tank. When water flow stops, slowly open a cold water tap nearby and let water run until air is purged from the unit. Then close tap.
15. Make all electrical connections according to codes. Plug the valve into an approved power source. Do not insert meter cable into the meter yet.
16. Tank one has control valve and tank two has adapter.
17. Look on the right side of the control valve, it has indicators showing which position the control valve is in during Regeneration and which tank is In Service.

NOTE: Make sure the meter cable is not inserted in the meter dome. Swing the timer out to expose the program wheel. To swing timer out, grab onto the lower right corner of timer face and pull outward.

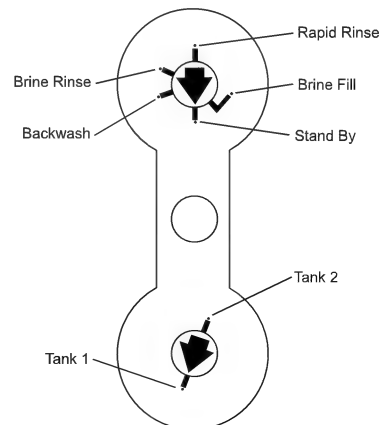
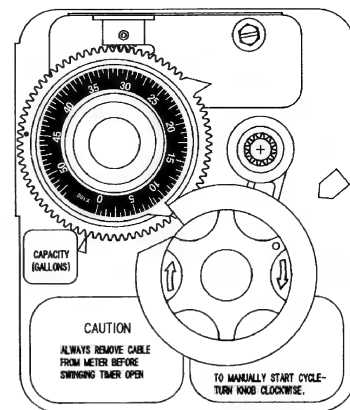
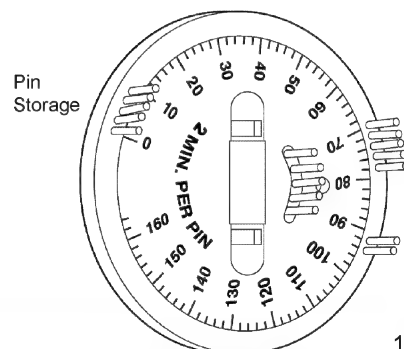


Figure 3 Control Valve Position Indicators



61591 Rev A

Figure 4 Timer



19210 Rev D

Figure 5 Program Wheel

INSTALLATION & START-UP *continued*

18. Cycle timer into backwash position. Turn manual knob so that the micro switch rides on the first set of pins. In this position the tanks switch (lower piston) and the control valve moves to the backwash position (upper piston). Wait until the positioning of upper and lower pistons stops before advancing the timer further. If advanced too fast the control will not home into the In Service position (it will not advance to any other position). To correct this, rotate the manual knob back to In Service and start again into backwash.

NOTE: Once valve positions itself into the backwash cycle, the homing circuit locks in.

19. With all the air backwashed, slowly cycle the timer to the brine position; rapid rinse; and brine tank refill. Wait for the control drive motor to position itself in each cycle and stop, before advancing on to the next position.
20. Once back in the In Service position, cycle the control valve again into the backwash position. The tanks switch again, and air head backwashes out of the other tank. Cycle the control back to the In Service position. Leave the timer in the open position. DO NOT insert meter cable yet.

NOTE: Two motors are available.

1/15 RPM has 82 minute regeneration time.

1/30 RPM has 164 minute regeneration time.

Valve To Tank Installation

1. Spin the valve onto the tank, ensuring the threads are not cross-threaded.

NOTE: All Fleck® valves are right-hand threads, or clockwise, to install

2. Rotate the valve freely without using force until it comes to a stop (this position is considered zero).
3. Rotate the valve clockwise from zero, between ¼ turn and ½ turn (see Figure 6).

NOTE: If lubricant is required, a silicone compound is strongly recommended. Dow Corning® Silicone Compound (available from Fleck®), is recommended for best possible results. Dow Corning® 7 Release Compound is used in the manufacture of Fleck® control valves. The use of other types of lubricants may attack the control's plastic or rubber components. Petroleum-based lubricants can cause swelling in rubber parts, including O-rings and seals.

| Part No. | Description |
|----------|-----------------------|
| 16174 | Silicone, 2 oz Tube |
| 16586-8 | Silicone, Dow #7 8 LB |

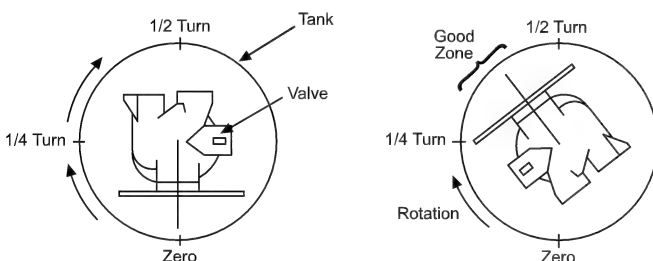


Figure 6

Setting the Regeneration Cycle Program

The Regeneration cycle program on the water conditioner is preset at the factory. However, portions of the cycle or program time may be lengthened or shortened for local conditions or system design.

1. Expose cycle program wheel by grasping timer in lower right hand corner and pulling. This releases snap retainer and swings timer to the left

NOTE: Meter cable must be removed from meter dome before opening timer.

2. Remove the program wheel by grasping program wheel and squeezing protruding lugs towards center. Lift program wheel off timer. Switch arms may require movement to facilitate removal.
3. Return timer to closed position by engaging snap retainer in back plate. Make certain all electrical wires locate above snap retainer post.

Changing Length of the Backwash Time

Looking at the numbered side of the program wheel, the group of pins starting at zero determines the length of time the unit backwashes.

Example: If there are six pins in this section, the time of backwash is 12 minutes (2 minutes per pin). To change the length of backwash time, add or remove pins as required.

The number of pins multiplied by two equals minutes of backwash.

Changing Length of Brine and Rinse Time

The group of holes between the last pin in the backwash section and the second group of pins determines the length of time that a unit will brine and rinse (2 minutes per hole).

To change the length of brine and rinse time, add or remove pins in the rapid rinse group of pins to increase or decrease the number of holes in the brine and rinse section.

The number of holes multiplied by two equals minutes of brine and rinse.

Changing Length Of Rapid Rinse

The second group of pins on the program wheel determines the length of time the water conditioner rapid rinses (2 minutes per pin). To change the length of rapid rinse time, add or remove pins at the higher numbered end of this section as required.

The number of pins multiplied by two equals minutes of rapid rinse.

NOTE: Program wheels with 0–82 minute cycle times, use one minute per pin or hole to set Regeneration times. The layout of pins and holes on the program wheel follow the same procedure as on this page.

Changing Length of Brine Tank Refill Time

The second group of holes on the program wheel determines the length of time the water conditioner refills the brine tank (2 minutes per hole).

To change the length of refill time, move the two pins at the end of the second group of holes as required.

The Regeneration cycle is complete when the two pin set at end of the brine tank refill section trips the outer micro-switch. The program wheel, however, continues to rotate until the inner micro-switch drops into the notch on the program wheel.

INSTALLATION & START-UP *continued*

Programming

1. The control valve is set at the factory for backwash; brine and slow rinse; rapid rinse and brine tank fill times. Change any of these times by repositioning the pins and holes or adding more pins.

NOTE: Two timer motors are available.

1/15 RPM has 82 minute Regeneration Time and each pin or hole equals one minute.

1/30 RPM has 164 minute Regeneration Time and each pin or hole equals two minutes.

2. The control valve has a separate brine tank fill cycle. Calculate the desired salt setting using the brine line flow control rate of refill (in gpm) multiplied by the timer setting. Then, using one gallon of fresh water dissolving approximately 3 lbs salt, calculate the refill time.

Example: A desired 30 lbs salt setting:

The unit has a 1.0 gpm refill rate so a 10 gallon fill is required.

10 gallons x 3 lbs/gals = 30 lbs salt

Set the timer refill section at 10 minutes.

10 minutes x 1.0 gpm = 10 gallon fill

NOTE: There must always be two pins at the end of a refill time to stop the fill cycle. With the Regeneration times set, place timer back to its original position, making sure the lower right hand corner snaps back into the backplate and the meter cable slides through the backplate and does not bind.

3. Setting the gallon wheel. Knowing the amount of resin in each tank and the salt setting per Regeneration, calculate the gallons available, using the following capacities as a guide:

$(\text{capacity per ft}^3 \times \text{ft}^3 \text{ of resin per tank}) = \text{gallons available compensated hardness of H}_2\text{O}$

NOTE: Based on tank size: More resin increases capacity, less resin decreases capacity. More salt increases capacity, less salt decreases capacity.

Example:

| | | |
|---|---|---|
| Tank Diameter | = | 16" |
| Compensated Hardness | = | 35 grains per gallon (tested sample) |
| ft ³ Resin (based on flow rate) | = | 4 |
| Lbs of Salt | = | 8 |
| Capacity per ft ³ | = | 24,000 |
| $(24,000 \times 4 \text{ ft}^3 \text{ of resin per tank})$ 35 grains | = | 2,740 gallons available before regeneration |

Complete step 4 before setting gallons on the meter wheel.

4. Because the control valve regenerates with soft water from the other tank, subtract the water used for regeneration. Take each regeneration cycle and calculate the water used.

Example: Unit is set for a 16" diameter tank with 4 ft³ of resin and salted at 8 lbs. per ft³, 7 gpm backwash, #3 injector, 1.0 gpm brine refill, and 60 psi and timer set for 10 min. backwash, 60 min. brine and rinse, 10 min. rapid rinse, 10 min. brine tank fill.

Backwash 10 min x 7.0 gpm = 70.0 gal

Brine and Rinse 60 min x 1.0 gpm = 60.0 gal

Rapid Rinse 10 min x 7.0 gpm = 70.0 gal

Brine Tank Fill 10 min x 1.0 gpm = 10.0 gal

Total Regeneration Water = 210.0 gal

With the 2740 gallons available calculated in Step 3, subtract the Regeneration water used from the total water available.

2740 gallons available - 210 gallons used = 2530 gallons (in Regeneration, Step 4)

5. Set meter wheel at approximately 2530 gallons. Lift the inner dial of the meter program wheel so that you can rotate it freely. Position the white dot opposite the 2530 gallon setting.

NOTE: There is a slight delay between the time the meter zeros out and the cycle starts. Units using the:

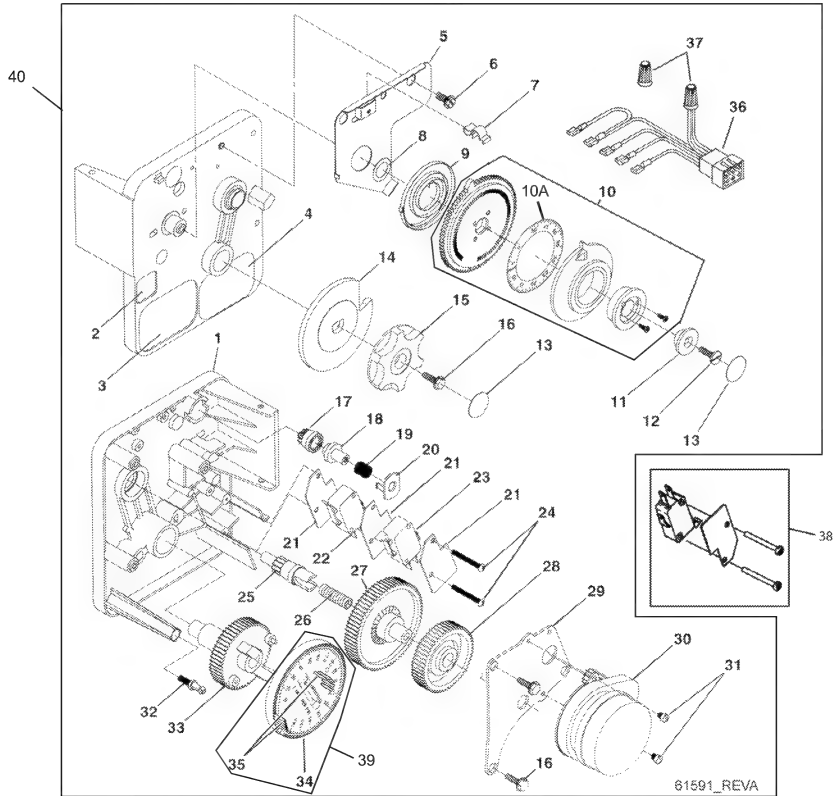
1/15 RPM motor, 82 minute Regeneration Time has a 9 minute delay

1/30 RPM motor, 180 minute Regeneration Time has an 18 minute delay.

NOTE: This delay period is not critical on residential equipment. However, take this factor into consideration for commercial applications by subtracting continuous flows for 9 minutes or 18 minutes from water available.

6. Insert meter cable into meter.
7. Check bypass.
8. Plug in unit.

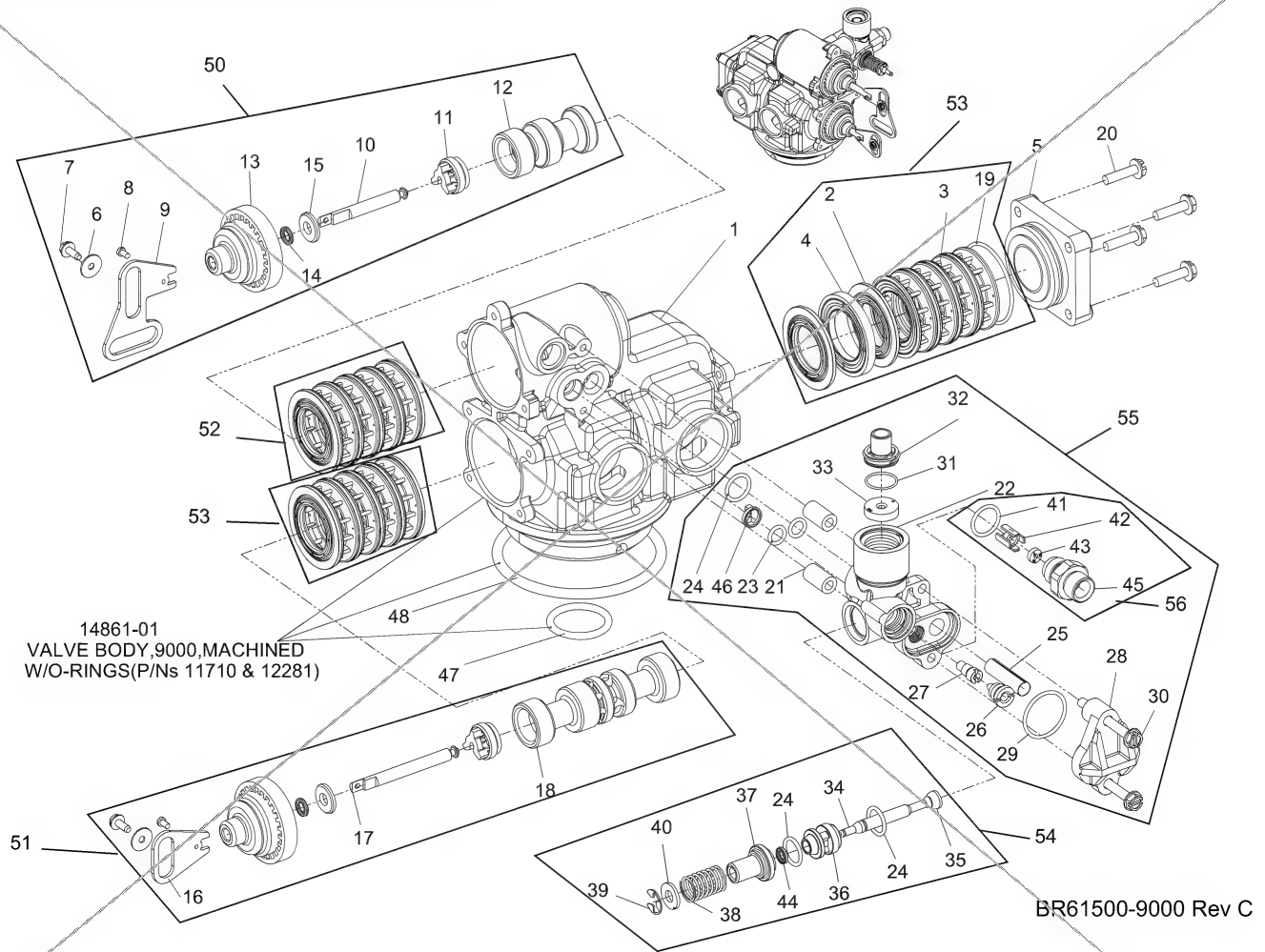
9000/9100/9500 (3200 SERIES) ELECTRO MECHANICAL TIMER ASSEMBLY



| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|--------|---------------|---|----------|---------|---------------|---|
| 1..... | 1..... | 13870-03..... | Housing, Timer, 9000 | 17..... | 1..... | 17724..... | Program Wheel, Pinion Drive |
| 2..... | 1..... | 17870..... | Label, Indicator, 9000 Timer | 18..... | 1..... | 17723..... | Clutch, Drive Pinion |
| 3..... | 1..... | 15465..... | Label, Caution | 19..... | 1..... | 14276..... | Spring, Meter Clutch |
| 4..... | 1..... | 16930..... | Label, Instruction | 20..... | 1..... | 14253..... | Retainer, Clutch Spring |
| 5..... | 1..... | 15227..... | Plate, Clutch, Actuator | 21..... | 3..... | 14087..... | Insulator |
| 6..... | 1..... | 10300..... | Screw, Slot Hex Washer, 18-8 x 3/8 | 22..... | 1..... | 15314..... | Switch, Micro, Modified |
| 7..... | 1..... | 17513..... | Clip, Spring | 23..... | 1..... | 15320..... | Switch, Micro, Timer |
| 8..... | 1..... | 15407..... | Washer, Plain, #4 | 24..... | 2..... | 11413..... | Screw, Pan Hd Mach, 4-40 x 1 1/8 |
| 9..... | 1..... | 15228..... | Spring, Return | 25..... | 1..... | 13018..... | Pinion, Idler |
| 10..... | 1..... | 16270-10..... | Program Wheel Assy, 9000/9100, 3/4" STD, 0-2, 100 | 26..... | 1..... | 18563..... | Spring, Idler Shaft |
| | | 16270-30..... | Program Wheel Assy, 9000/9100, 1" STD, 0-5, 100 | 27..... | 1..... | 13017..... | Gear, Idler |
| | | 16270-40..... | Program Wheel Assy, 9000/9100, 1" EXT, 0-25, 500 | 28..... | 1..... | 13164..... | Gear, Drive |
| | | 16270-50..... | Program Wheel Assy, 9000/9100/9500, 3/4" EXT, 1.5" STD, 0-10, 500 | 29..... | 1..... | 13887..... | Plate, Motor Mounting |
| | | 16270-60..... | Program Wheel Assy, 9500, 1.5" EXT, 0-50, 000 | 30..... | 1..... | 18743-1..... | Motor, 120V, 60 Hz 1/30 RPM, 5600 |
| 10A..... | | 24673..... | Volume Label, Metric, 9000/9100, 3/4" STD, 0-8m3 | | | 18824-1..... | Motor, 230V, 50 Hz 1/30 RPM |
| | | 24672..... | Volume Label, Metric, 9000/9100, 1" STD, 0-20m3 | | | 19170..... | Motor, 120V 60 Hz 1/15 RPM |
| | | 24676..... | Volume Label, Metric, 9000/9100, 1" EXT, 0-100m3 | | | 18825..... | Motor, 230V, 50 Hz 1/15 RPM Mallory |
| | | 24675..... | Volume Label, Metric, 9000/9100/9500, 3/4" EXT, 1.5" STD 0-40m3 | 31..... | 2..... | 13278..... | Screw, Phil Hd Mach, 6-32 x 1/8 Steel Zinc |
| | | 25027..... | Volume Label, Metric, 9500, 1.5" EXT, 1.5" EXT 0-200m3 | 32..... | 1..... | 14265..... | Clip, Spring |
| 11..... | 1..... | 13806..... | Retainer, Program Wheel | 33..... | 1..... | 15055..... | Timer, Main Drive Gear |
| 12..... | 1..... | 13748..... | Screw, Flt Hd St, 6-20 x 1/2 | 34..... | 1..... | 19210-02..... | Program Wheel Assy, 9000 1/15 |
| 13..... | 2..... | 11999..... | Label, Button | | | 19210-05..... | Program Wheel Assy, 9000/3230 |
| 14..... | 1..... | 15223..... | Actuator, Cycle | 35..... | 23..... | 15493..... | Pin, Spring, 1/16 x 5/8 SS |
| 15..... | 1..... | 13886..... | Know, 3200 | 36..... | 1..... | 15203..... | Harness, 9000/9500, Timer |
| 16..... | 4..... | 13296..... | Screw, Hex Washer, 6-20 x 1/2 | 37..... | 2..... | 40422..... | Nut, Wire, Tan |
| | | | | 38..... | 1..... | 60320-02..... | Switch Kit, 3200/9000 Timer Auxiliary |
| | | | | 39..... | | 61420-69..... | Program Wheel & Gear Assy, 5-30-5-10-2, 2 Min Per Pin |
| | | | | | | 61420-80..... | Program Wheel & Gear Assy, 5-40-5-7-2, 2 Min Per Pin |
| | | | | 40..... | 1..... | * | Complete 9000 Meter Immediate Timer Assembly |

*Call your distributor for Part Number

9000 CONTROL VALVE ASSEMBLY



9000 CONTROL VALVE ASSEMBLY

continued

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------------|---------------------------------------|
| 1..... | 1 | 14861..... | Valve Body, 9000 |
| 2..... | 15 | 13242..... | Seal, 5600,9000, 9100 |
| 3..... | 12 | 14241..... | Spacer, 5600,9000, 9100 |
| 4..... | 1 | 16595..... | Spacer, 9000, 9100 |
| 5..... | 1 | 42278..... | End Cap, Plastic, 9000/9100 |
| 6..... | 2 | 13363..... | Washer, Hague Drive |
| 7..... | 2 | 17020..... | Screw, STL. Hex Washer, 6-20 x 3/8 |
| 8..... | 2 | 11335..... | Screw, #4-40 |
| 9..... | 1 | 14921..... | Link, Piston Rod |
| 10..... | 1 | 14919..... | Piston, Rod, Upper |
| 11..... | 2 | 14309..... | Retainer, Piston Rod |
| 12..... | 1 | 14914..... | Piston, 9000, 9100 Upper |
| 13..... | 2 | 13243..... | Plug, End, 5600, 9000, 9100 |
| 14..... | 2 | 10209..... | Quad Ring, -010 |
| 15..... | 2 | 13008..... | Retainer, End Plug Seal |
| 16..... | 1 | 15019..... | Link, Piston Rod, 9000/9500, 9100 |
| 17..... | 1 | 14920..... | Rod, Piston, Lower, 9000, 9100 |
| 18..... | 1 | 14905..... | Piston, 9000, 9100 Lower |
| 19..... | 1 | 40952..... | O-ring, -030 |
| 20..... | 4 | 15331..... | Screw, Hex Washer Head |
| 21..... | 2 | 13361..... | Spacer, 4600, 9000, 9100 |
| 22..... | 1 | 15215..... | Body, Injector, 9000, 9100 |
| 23..... | 2 | 13301..... | O-ring, -011 |
| 24..... | 3 | 13302..... | O-ring, -014 |
| 25..... | 1 | 10227..... | Screen, Injector |
| 26..... | 1 | 10913-000..... | Nozzle, Injector, #000, Brown |
| | | 10913-00..... | Nozzle, Injector, #00, Violet |
| | | 10913-0..... | Nozzle, Injector, #0, Red |
| | | 10913-1..... | Nozzle, Injector, #1, White |
| | | 10913-2..... | Nozzle, Injector, #2, Blue |
| | | 10913-3..... | Nozzle, Injector, #3, Yellow |
| | | 10913-4..... | Nozzle, Injector, #4, Green |
| 27..... | 1 | 10914-000..... | Throat, Injector, #000, Brown |
| | | 10914-00..... | Throat, Injector, #00, Violet |
| | | 10914-0..... | Throat, Injector, #0, Red |
| | | 10914-1..... | Throat, Injector, #1, White |
| | | 10914-2..... | Throat, Injector, #2, Blue |
| | | 10914-3..... | Throat, Injector, #3, Yellow |
| | | 10914-4..... | Throat, Injector, #4, Green |
| 28..... | 1 | 13166..... | Cap, Injector, 5600, 9000, 9100 |
| 29..... | 1 | 13303..... | O-ring, -021 |
| 30..... | 2 | 13387..... | Screw, Hex Washer Head |
| 31..... | 1 | 15348..... | O-ring, -563 |
| 32..... | 1 | 13173-01..... | Retainer, DLFC Button |
| 33..... | 1 | 19153..... | Washer, Flow, 0.6 GPM |
| | | 19152..... | Washer, Flow, 0.8 GPM |
| | | 12097..... | Washer, Flow, 1.0 GPM |
| | | 12085..... | Washer, Flow, 1.2 GPM |
| | | 19150..... | Washer, Flow, 1.3 GPM |
| | | 12086..... | Washer, Flow, 1.5 GPM |

| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------------|---|
| | | 19149..... | Washer, Flow, 1.7 GPM |
| | | 12087..... | Washer, Flow, 2.0 GPM |
| | | 12088..... | Washer, Flow, 2.4 GPM |
| | | 12089..... | Washer, Flow, 3.0 GPM |
| | | 12090..... | Washer, Flow, 3.5 GPM |
| | | 12091..... | Washer, Flow, 4.0 GPM |
| | | 19147..... | Washer, Flow, 4.5 GPM |
| | | 12092..... | Washer, Flow, 5.0 GPM |
| | | 17814..... | Washer, Flow, 6.0 GPM |
| | | 12408..... | Washer, Flow, 7.0 GPM |
| 34..... | 1 | 14925..... | Brine Valve Stem, 9000, 9100 |
| 35..... | 1 | 12626..... | Seat, Brine Valve |
| 36..... | 1 | 13167..... | Spacer, Brine Valve |
| 37..... | 1 | 13165..... | Cap, Brine Valve |
| 38..... | 1 | 11973..... | Spring, Brine Valve |
| 39..... | 1 | 11981-01..... | Ring, Retaining, SS |
| 40..... | 1 | 16098..... | Washer, Nylon Brine |
| 41..... | 1 | 12977..... | O-ring, -015 |
| 42..... | 1 | 13245..... | Retainer, BLFC |
| 43..... | 1 | 17307..... | Washer, Flow, 0.125 GPM |
| | | 12094..... | Washer, Flow, 0.25 GPM |
| | | 12095..... | Washer, Flow, 0.50 GPM |
| | | 12097..... | Washer, Flow, 1.0 GPM |
| 44..... | 1 | 12550..... | Quad Ring, -009 |
| 45..... | 1 | 13244-01..... | Adapter, BLFC |
| 46..... | 1 | 13497..... | Air Disperser, Injector |
| 47..... | 1 | 11710..... | O-ring, -215 |
| 48..... | 1 | 12281..... | O-ring, -338 |
| 50..... | | 60400..... | Piston Assy, 9000, 9100 Upper |
| | | 60400-01..... | Piston Assy, 9000 Upper, HW |
| | | 60400-001..... | Piston Assy, 9000, 9100 Upper, 560CD |
| 51..... | | 60401..... | Piston Assy, 9000, 9100 Lower |
| | | 60401-01..... | Piston Assy, 9000 Lower, HW |
| | | 60401-001..... | Piston Assy, 9000, 9100 Lower, 560CD |
| 52..... | | 60125..... | Seal & Spacer Kit, 5600/9000/9100 Upper |
| | | 60125-15..... | Seal & Spacer Kit, 5600/9000/9100 Upper Blue |
| | | 60125HW..... | Seal & Spacer Kit, 9000 Upper |
| 53..... | | 60421..... | Seal & Spacer Kit, 9000/9100 Lower |
| | | 60421HW..... | Seal & Spacer Kit, 9000 Lower |
| | | 60421-50..... | Seal & Spacer Kit, 9000/9100 Lower, 559PE |
| 54..... | | 60350..... | Brine Valve Assy, 9000, 9100 |
| | | 60350-01..... | Brine Valve Assy, 9000, 560CD, Hot Water |
| 55..... | | 60385-0011..... | Injector Drain, 9000, 9100, 0.25 BLFC #0 INJ, 1.2 DLFC |
| | | 60385-0111..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 1.2 DLFC |

9000 CONTROL VALVE ASSEMBLY

continued

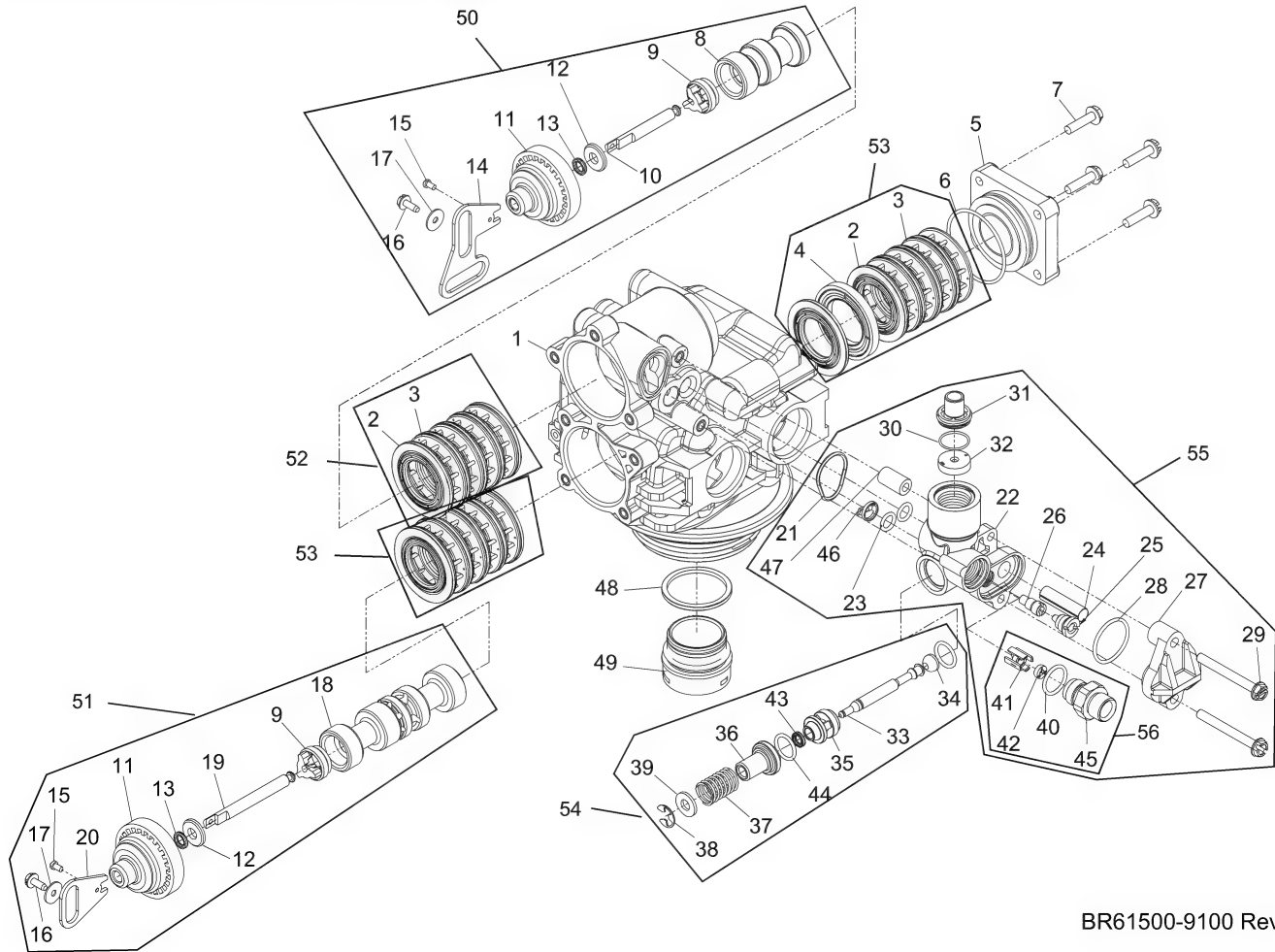
| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|---|
| | | 60385-0121..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 1.5 DLFC |
| | | 60385-0131..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 2.0 DLFC |
| | | 60385-0141..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 2.4 DLFC |
| | | 60385-0012..... | Injector Drain, 9000, 9100, 0.50 BLFC #0 INJ, 1.2 DLFC |
| | | 60385-0112..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 1.2 DLFC |
| | | 60385-0122..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 1.5 DLFC |
| | | 60385-0132..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 2.0 DLFC |
| | | 60385-0142..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 2.4 DLFC |
| | | 60385-0182..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 5.0 DLFC |
| | | 60385-0222..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 1.5 DLFC |
| | | 60385-0242..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 2.4 DLFC |
| | | 60385-0252..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 3.0 DLFC |
| | | 60385-0262..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 3.5 DLFC |
| | | 60385-0272..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 4.0 DLFC |
| | | 60385-0282..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 5.0 DLFC |
| | | 60385-02A2..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 6.0 DLFC |
| | | 60385-0202..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, Blank DLFC |
| | | 60385-0372..... | Injector Drain, 9000, 9100, 0.50 BLFC #3 INJ, 4.0 DLFC |
| | | 60385-0382..... | Injector Drain, 9000, 9100, 0.50 BLFC #3 INJ, 5.0 DLFC |
| | | 60385-0482..... | Injector Drain, 9000, 9100, 0.50 BLFC #4 INJ, 5.0 DLFC |
| | | 60385-0133..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 2.0 DLFC |
| | | 60385-0143..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 2.4 DLFC |
| | | 60385-0163..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 3.5 DLFC |
| | | 60385-0233..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 2.0 DLFC |
| | | 60385-0243..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 2.4 DLFC |
| | | 60385-0253..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 3.0 DLFC |
| | | 60385-0263..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 3.5 DLFC |
| | | 60385-0273..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 4.0 DLFC |
| | | 60385-0353..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 3.0 DLFC |
| | | 60385-0373..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 4.0 DLFC |

| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|--|
| | | 60385-0383..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 5.0 DLFC |
| | | 60385-0393..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 7.0 DLFC |
| | | 60385-0120..... | Injector Drain, 9000, 9100, Blank BLFC #1 INJ, 1.5 DLFC |
| 56..... | | 60022-12..... | BLFC, 0.125 GPM, 5000/5600/9000/9100 |
| | | 60022-25..... | BLFC, 0.25 GPM, 5000/5600/9000/9100 |
| | | 60022-50..... | BLFC, 0.50 GPM, 5000/5600/9000/9100 |
| | | 60022-100..... | BLFC, 1.0 GPM, 5000/5600/9000/9100 |

Not Shown

| | | |
|---------|------------|---------------------------------------|
| 1 | 12128..... | Label, 0.25 GPM BLFC |
| 1 | 13333..... | Label, Injector |
| 1 | 10760..... | Label, 1 GPM, 3 lbs salt/min |
| ..... | 10759..... | Label, 0.5 GPM, 1.5 lbs salt |
| ..... | 19654..... | Label, 0.125 GPM Brine Refill Flow |

9100 CONTROL VALVE ASSEMBLY



BR61500-9100 Rev C

9100 CONTROL VALVE ASSEMBLY

continued

| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-----|----------------|---------------------------------------|----------|------------|------------------------|---|
| 1..... | 1 | 40688..... | Valve Body Assy, 9100 | ..... | 12088..... | Washer, Flow, 2.4 GPM | |
| 2..... | 15 | 13242..... | Seal, 5600,9000, 9100 | ..... | 12089..... | Washer, Flow, 3.0 GPM | |
| 3..... | 12 | 14241..... | Spacer, 5600,9000, 9100 | ..... | 12090..... | Washer, Flow, 3.5 GPM | |
| 4..... | 1 | 16595..... | Spacer, 9000, 9100 | ..... | 12091..... | Washer, Flow, 4.0 GPM | |
| 5..... | 1 | 42278..... | End Cap, Plastic, 9000/9100 | ..... | 19147..... | Washer, Flow, 4.5 GPM | |
| 6..... | 1 | 40952..... | O-ring, -030 | ..... | 12092..... | Washer, Flow, 5.0 GPM | |
| 7..... | 4 | 15331..... | Screw, Hex Washer Head | ..... | 17814..... | Washer, Flow, 6.0 GPM | |
| 8..... | 1 | 14914..... | Piston, 9000, 9100 Upper | ..... | 12408..... | Washer, Flow, 7.0 GPM | |
| 9..... | 2 | 14309..... | Retainer, Piston Rod | 33..... | 1 | 14925..... | Brine Valve Stem, 9000, 9100 |
| 10..... | 1 | 14919..... | Piston, Rod, Upper | 34..... | 1 | 12626..... | Seat, Brine Valve |
| 11..... | 2 | 13243..... | Plug, End, 5600, 9000, 9100 | 35..... | 1 | 13167..... | Spacer, Brine Valve |
| 12..... | 2 | 13008..... | Retainer, End Plug Seal | 36..... | 1 | 13165..... | Cap, Brine Valve |
| 13..... | 2 | 10209..... | Quad Ring, -010 | 37..... | 1 | 11973..... | Spring, Brine Valve |
| 14..... | 1 | 14921..... | Link, Piston Rod | 38..... | 1 | 11981-01..... | Ring, Retaining, SS |
| 15..... | 2 | 11335..... | Screw, #4-40 | 39..... | 1 | 16098..... | Washer, Nylon Brine |
| 16..... | 2 | 17020..... | Screw, STL. Hex Washer, 6-20 x 3/8 | 40..... | 1 | 12977..... | O-ring, -015 |
| 17..... | 2 | 13363..... | Washer, Hague Drive | 41..... | 1 | 13245..... | Retainer, BLFC |
| 18..... | 1 | 14905..... | Piston, 9000, 9100 Lower | 42..... | 1 | 17307..... | Washer, Flow, 0.125 GPM |
| 19..... | 1 | 14920..... | Rod, Piston, Lower, 9000, 9100 | ..... | 12094..... | Washer, Flow, 0.25 GPM | |
| 20..... | 1 | 15019..... | Link, Piston, Rod, 9000/9500 | ..... | 12095..... | Washer, Flow, 0.50 GPM | |
| 21..... | 1 | 41500..... | O-ring, 9100 Drain | ..... | 12097..... | Washer, Flow, 1.0 GPM | |
| 22..... | 1 | 15215..... | Body, Injector, 9000, 9100 | 43..... | 1 | 12550..... | Quad Ring, -009 |
| 23..... | 2 | 13301..... | O-ring, -011 | 44..... | 2 | 13302..... | O-ring, -014 |
| 24..... | 1 | 10227..... | Screen, Injector | 45..... | 1 | 13244-01..... | Adapter, BLFC |
| 25..... | 1 | 10913-000..... | Nozzle, Injector, #000, Brown | 46..... | 1 | 13497..... | Air Dispereser, Injector |
| ..... |  | 10913-00..... | Nozzle, Injector, #00, Violet | 47..... | 1 | 13361..... | Spacer, 4600, 9100 |
| ..... |  | 10913-0..... | Nozzle, Injector, #0, Red | 48..... | 1 | 40538..... | Retainer, 32 mm, O-ring DIST, 7000 |
| ..... |  | 10913-1..... | Nozzle, Injector, #1, White | 49..... | 1 | 61419..... | Kit, 1.05" Distributor Adapter |
| ..... |  | 10913-2..... | Nozzle, Injector, #2, Blue | 50..... | | 60400..... | Piston Assy, 9000, 9100 Upper |
| ..... |  | 10913-3..... | Nozzle, Injector, #3, Yellow | ..... |  | 60400-001..... | Piston Assy, 9000, 9100 Upper, 560CD |
| ..... |  | 10913-4..... | Nozzle, Injector, #4, Green | 51..... | | 60401..... | Piston Assy, 9000, 9100 Lower |
| 26..... | 1 | 10914-000..... | Throat, Injector, #000, Brown | ..... |  | 60401-01..... | Piston Assy, 9000 Lower, HW |
| ..... |  | 10914-00..... | Throat, Injector, #00, Violet | ..... |  | 60401-001..... | Piston Assy, 9000, 9100 Lower, 560CD |
| ..... |  | 10914-0..... | Throat, Injector, #0, Red | 52..... | | 60125..... | Seal & Spacer Kit, 5600/9000/9100 Upper |
| ..... |  | 10914-1..... | Throat, Injector, #1, White | ..... |  | 60125-15..... | Seal & Spacer Kit, 5600/9000/9100 Upper Blue Silicone |
| ..... |  | 10914-2..... | Throat, Injector, #2, Blue | 53..... | | 60421..... | Seal & Spacer Kit, 9000/9100 Lower |
| ..... |  | 10914-3..... | Throat, Injector, #3, Yellow | ..... |  | 60421-50..... | Seal & Spacer Kit, 9000/9100 Lower, 559PE |
| ..... |  | 10914-4..... | Throat, Injector, #4, Green | 54..... | | 60350..... | Brine Valve Assy, 9000, 9100 |
| 27..... | 1 | 13166..... | Cap, Injector, 5600, 9000, 9100 | 55..... | | 60385-0011..... | Injector Drain, 9000, 9100, 0.25 BLFC #0 INJ, 1.2 DLFC |
| 28..... | 1 | 13303..... | O-ring, -021 | ..... |  | 60385-0111..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 1.2 DLFC |
| 29..... | 2 | 13387..... | Screw, Hex Washer Head | ..... |  | 60385-0121..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 1.5 DLFC |
| 30..... | 1 | 15348..... | O-ring, -563 | ..... |  | 60385-0131..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 2.0 DLFC |
| 31..... | 1 | 13173-01..... | Retainer, DLFC Button | ..... |  | 60385-0141..... | Injector Drain, 9000, 9100, 0.25 |
| 32..... | 1 | 19153..... | Washer, Flow, 0.6 GPM | | | | |
| ..... |  | 19152..... | Washer, Flow, 0.8 GPM | | | | |
| ..... |  | 12097..... | Washer, Flow, 1.0 GPM | | | | |
| ..... |  | 12085..... | Washer, Flow, 1.2 GPM | | | | |
| ..... |  | 19150..... | Washer, Flow, 1.3 GPM | | | | |
| ..... |  | 12086..... | Washer, Flow, 1.5 GPM | | | | |
| ..... |  | 19149..... | Washer, Flow, 1.7 GPM | | | | |
| ..... |  | 12087..... | Washer, Flow, 2.0 GPM | | | | |

9100 CONTROL VALVE ASSEMBLY

continued

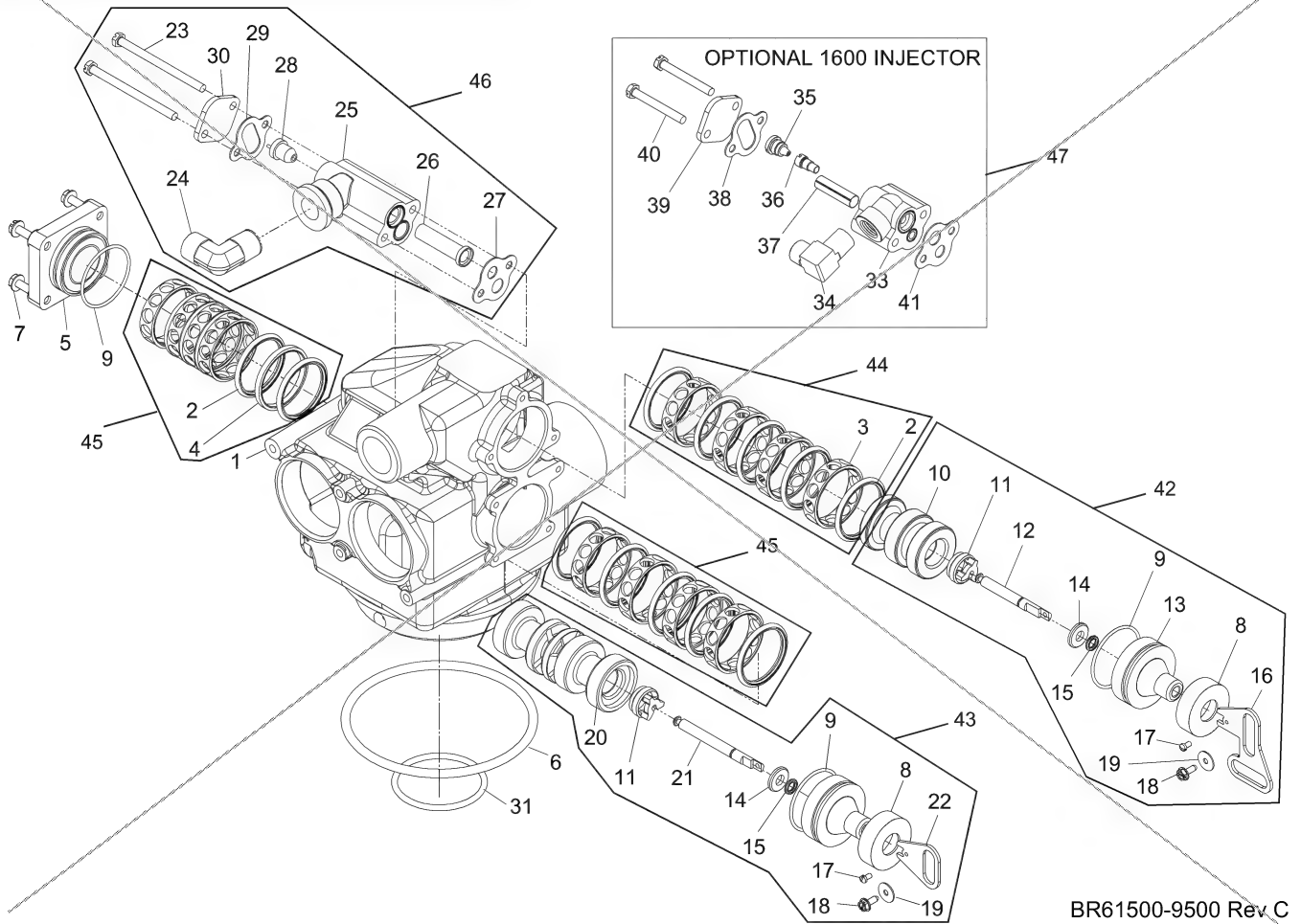
| | |
|-----------------------|---|
| | BLFC #1 INJ, 2.4 DLFC |
| 60385-0012..... | Injector Drain, 9000, 9100, 0.50 BLFC #0 INJ, 1.2 DLFC |
| 60385-0112..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 1.2 DLFC |
| 60385-0122..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 1.5 DLFC |
| 60385-0132..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 2.0 DLFC |
| 60385-0142..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 2.4 DLFC |
| 60385-0182..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 5.0 DLFC |
| 60385-0222..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 1.5 DLFC |
| 60385-0242..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 2.4 DLFC |
| 60385-0252..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 3.0 DLFC |
| 60385-0262..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 3.5 DLFC |
| 60385-0272..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 4.0 DLFC |
| 60385-0282..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 5.0 DLFC |
| 60385-02A2..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 6.0 DLFC |
| 60385-0202..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, Blank DLFC |
| 60385-0372..... | Injector Drain, 9000, 9100, 0.50 BLFC #3 INJ, 4.0 DLFC |
| 60385-0382..... | Injector Drain, 9000, 9100, 0.50 BLFC #3 INJ, 5.0 DLFC |
| 60385-0482..... | Injector Drain, 9000, 9100, 0.50 BLFC #4 INJ, 5.0 DLFC |
| 60385-0133..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 2.0 DLFC |
| 60385-0143..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 2.4 DLFC |
| 60385-0163..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 3.5 DLFC |
| 60385-0233..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 2.0 DLFC |
| 60385-0243..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 2.4 DLFC |
| 60385-0253..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 3.0 DLFC |
| 60385-0263..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 3.5 DLFC |
| 60385-0273..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 4.0 DLFC |
| 60385-0353..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 3.0 DLFC |
| 60385-0373..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 4.0 DLFC |
| 60385-0383..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 5.0 DLFC |
| 60385-0393..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 7.0 DLFC |
| 60385-0120..... | Injector Drain, 9000, 9100, Blank |

| Item No. | QTY | Part No. | Description |
|----------|-----|----------------------|---|
| | | | BLFC #1 INJ, 1.5 DLFC |
| 56..... | | 60022-12..... | BLFC, 0.125 GPM, 5000/5600/9000/9100 |
| | | 60022-25..... | BLFC, 0.25 GPM, 5000/5600/9000/9100 |
| | | 60022-50..... | BLFC, 0.50 GPM, 5000/5600/9000/9100 |
| | | 60022-100..... | BLFC, 1.0 GPM, 5000/5600/9000/9100 |

Not Shown

| | | |
|---------|------------|---------------------------------------|
| 1 | 13333..... | Label, Injector |
| 1 | 10759..... | Label, 0.5 GPM, 1.5 lbs salt/min |
| ..... | 18569..... | Retainer, Tank Seal |
| ..... | 18303..... | O-ring, -336, Top of Tank |
| ..... | 12128..... | Label, 0.25 GPM BLFC |
| ..... | 10760..... | Label 1 GPM, 3 lbs Salt |
| ..... | 19654..... | Label, 0.125 GPM Brine Refill Flow |

9500 CONTROL VALVE ASSEMBLY



BR61500-9500 Rev C

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|-------------------------------------|
| 1..... | 1 | 16919..... | Valve Body, 9500, Machining |
| 2..... | 15 | 16101..... | Seal, 2850, 4500 |
| | | 41113..... | Seal, 2850, 559PE |
| 3..... | 12 | 16638..... | Spacer, 9500/2850, Cold & Hot Water |
| | | 16638-02..... | Spacer, 9500/2850, MS1050, Plastic |
| 4..... | 1 | 17092..... | Spacer, Disc, 9500 |
| 5..... | 1 | 42278-01..... | End Cap, Plastic, 9500 |
| 6..... | 1 | 16455..... | O-ring, -347 |
| 7..... | 4 | 15331..... | Screw, Hex Washer Head |
| 8..... | 2 | 17558..... | Disc, Spacer, End Plug |
| 9..... | 3 | 16394..... | O-ring, -029 |
| 10..... | 1 | 17110..... | Piston, 9500, Upper |
| 11..... | 2 | 14309..... | Retainer, Piston Rod |
| 12..... | 1 | 16957..... | Rod, Piston, 9500 |
| 13..... | 2 | 16954..... | Plug, End, 9500 |
| 14..... | 2 | 13008..... | Retainer, End Plug Seal |
| 15..... | 2 | 10209..... | Quad Ring, -010 |
| 16..... | 1 | 14921..... | Link, Piston Rod |
| 17..... | 2 | 11335..... | Screw, #4-40 |
| 18..... | 2 | 17020..... | Screw, STL. Hex Washer, 6-20 x 3/8 |
| 19..... | 2 | 13363..... | Washer, Plain, .145 ID S.S. |
| 20..... | 1 | 17111..... | Piston, 9500, Lower |
| 21..... | 1 | 16956..... | Rod, Piston, Lower, 9500 |
| 22..... | 1 | 15019..... | Link, Piston Rod, 9000/9500, 9100 |
| 23..... | 2 | 14804..... | Screw, Slotted Hex Head |

| Item No. | QTY | Part No. | Description |
|---|-----|----------------|--------------------------------------|
| 24..... | 1 | 15413..... | Fitting, Elbow, Male, 1/2 TX 3/8 NPT |
| 25..... | 1 | 17777-03..... | Body, Injector, 1700 |
| 26..... | 1 | 14802-03C..... | Throat, Injector, #3C, Yellow |
| | | 14802-04C..... | Throat, Injector, #4C, Green |
| | | 14802-05C..... | Throat Injector, #5C, White |
| | | 14802-06C..... | Throat Injector, #6C, Red |
| 27..... | 1 | 14805..... | Gasket, Injector Body |
| 28..... | 1 | 14801-03C..... | Nozzle, Injector, 3C, Yellow |
| | | 14801-04C..... | Nozzle, Injector, 4C, Green |
| | | 14801-05C..... | Nozzle, Injector, 5C, White |
| | | 14801-06C..... | Nozzle, Injector, 6C, Red |
| 29..... | 1 | 10229..... | Gasket, Injector Body |
| 30..... | 1 | 11893..... | Cap, Injector |
| 31..... | 1 | 13577..... | O-ring, -226 |
| Optional (1600) Injector Part Number | | | |
| 33..... | | 17776..... | Body, Injector, 1600 |
| 34..... | | 10328..... | Fitting, Elbow, 90 Deg. |
| 35..... | | 10913-1..... | Nozzle, Injector, #1, Natural |
| 36..... | | 10914..... | Throat, Injector |
| 37..... | | 10227..... | Screen, Injector |
| 38..... | | 10229..... | Gasket, Injector Body |
| 39..... | | 11893..... | Cap, Injector |
| 40..... | | 10692..... | Screw, Slot, Indented Hex Head |
| 41..... | | 14805..... | Gasket, Injector Body |

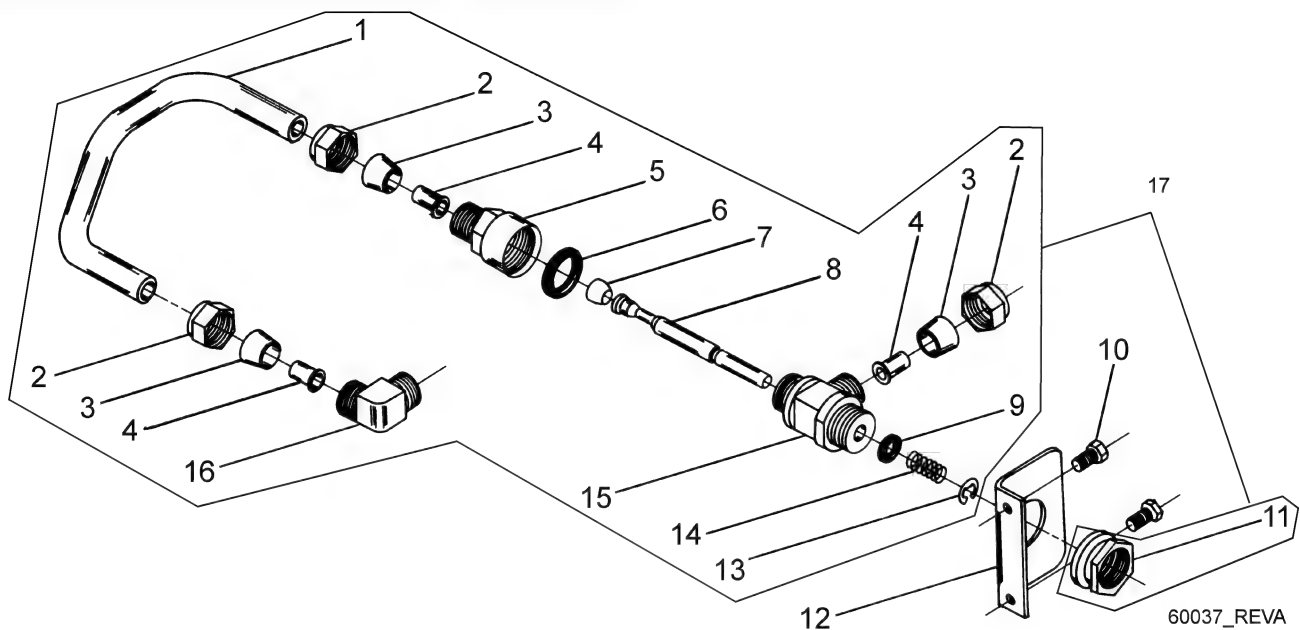
9100 CONTROL VALVE ASSEMBLY

continued

| Item No. | QTY | Part No. | Description |
|------------------|-----|---------------------|---|
| 42..... | | 60108..... | Piston Assy, 9500, Upper |
| | | 60108-01..... | Piston Assy, 9500, Upper, HW |
| | | 60108-02..... | Piston Assy, 9500, Upper, 560CD |
| 43..... | | 60109..... | Piston Assy, 9500, Lower |
| | | 60109-01..... | Piston Assy, 9500, HW, Lower |
| | | 60109-02..... | Piston Assy, 9500, Lower, 560CD |
| 44..... | | 60134..... | Seal & Spacer Kit, 9500, Upper, Hot & Cold |
| | | 60134-20..... | Seal & Spacer Kit, 9500, Upper, Plastic Spacers |
| | | 60134-30..... | Seal & Spacer Kit, 9500, Upper, Plastic Spacers, Chemical Resistent Seals |
| 45..... | | 60133-01..... | Seal & Spacer Kit, 9500, Lower, Hot & Cold |
| | | 60133-20..... | Seal & Spacer Kit, 9500, Lower, Plastic Spacers |
| | | 60133-30..... | Seal & Spacer Kit, 9500, Upper, Plastic Spacers, Chemical Resistent Seals |
| 46..... | | 60381-03..... | Injector Assy, 1700, #3C |
| | | 60381-04..... | Injector Assy, 1700, #4C |
| | | 60381-05..... | Injector Assy, 1700, #5C |
| | | 60381-06..... | Injector Assy, 1700, #6C |
| 47..... | | 60480-00..... | Injector Assy, 1600, #0, Plastic |
| | | 60480-01..... | Injector Assy, 1600, #1, Plastic |
| | | 60480-02..... | Injector Assy, 1600, #2, Plastic |
| | | 60480-03..... | Injector Assy, 1600, #3, Plastic |
| | | 60480-04..... | Injector Assy, 1600, #4, Plastic |
| | | 60481-21..... | Injector Assy, 1600, #1, S.S. Brass, HW |
| | | 60481-22..... | Injector Assy, 1600, #2, S.S. Brass, HW |
| | | 60481-23..... | Injector Assy, 1600, #3, S.S. Brass, HW |
| | | 60080-11..... | Injector Assy, 1600, #1, PVC |
| | | 60080-12..... | Injector Assy, 1600, #2, PVC |
| | | 60080-14..... | Injector Assy, 1600, #4, PVC |
| Not Shown | | | |
| | | 60366-00..... | DLFC, 1"F x 3/4"F, NPT, No Button |
| | | 60366-06..... | DLFC, 1"F x 3/4"F, NPT, 0.6 GPM |
| | | 60366-08..... | DLFC, 1"F x 3/4"F, NPT, 0.8 GPM |
| | | 60366-10..... | DLFC, 1"F x 3/4"F, NPT, 1.0 GPM |
| | | 60366-12..... | DLFC, 1"F x 3/4"F, NPT, 1.2 GPM |
| | | 60366-13..... | DLFC, 1"F x 3/4"F, NPT, 1.3 GPM |
| | | 60366-15..... | DLFC, 1"F x 3/4"F, NPT, 1.5 GPM |
| | | 60366-17..... | DLFC, 1"F x 3/4"F, NPT, 1.7 GPM |
| | | 60366-20..... | DLFC, 1"F x 3/4"F, NPT, 2.0 GPM |
| | | 60366-24..... | DLFC, 1"F x 3/4"F, NPT, 2.4 GPM |
| | | 60366-30..... | DLFC, 1"F x 3/4"F, NPT, 3.0 GPM |
| | | 60366-35..... | DLFC, 1"F x 3/4"F, NPT, 3.5 GPM |
| | | 60366-40..... | DLFC, 1"F x 3/4"F, NPT, 4.0 GPM |
| | | 60366-45..... | DLFC, 1"F x 3/4"F, NPT, 4.5 GPM |

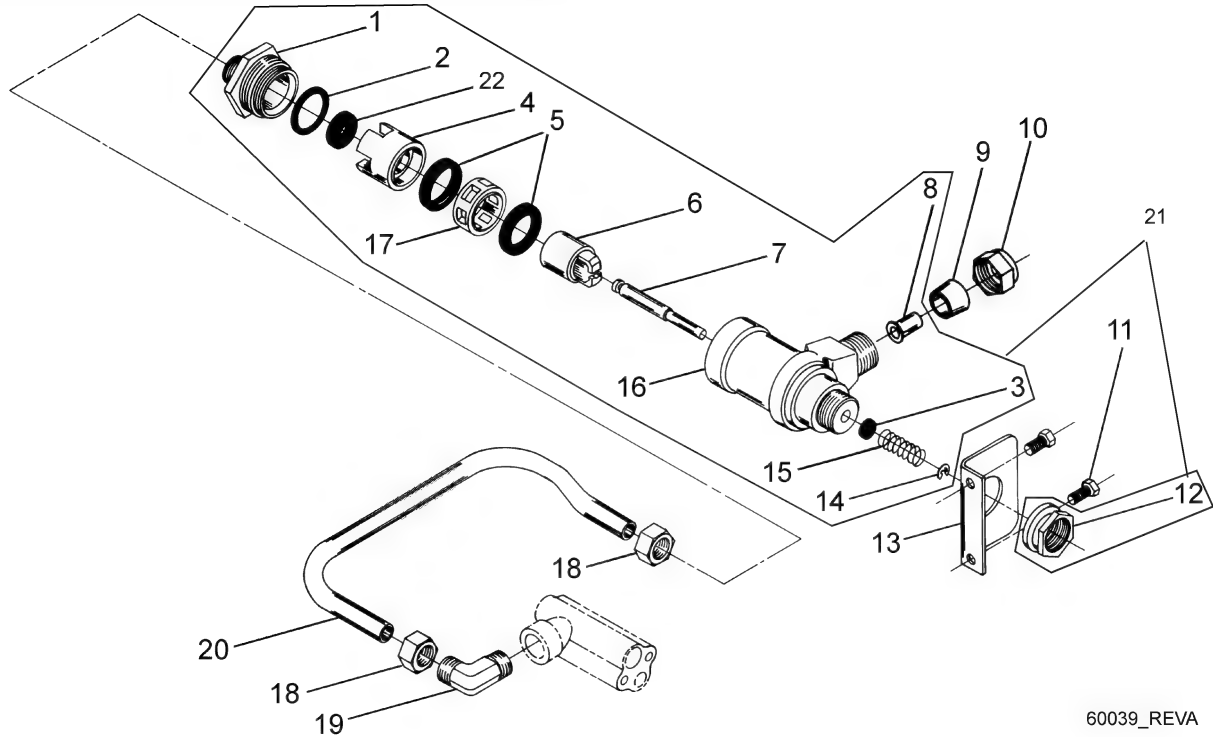
| Item No. | QTY | Part No. | Description |
|----------|-----|----------------------|--|
| | | 60366-50..... | DLFC, 1"F x 3/4"F, NPT, 5.0 GPM |
| | | 60366-60..... | DLFC, 1"F x 3/4"F, NPT, 6.0 GPM |
| | | 60366-70..... | DLFC, 1"F x 3/4"F, NPT, 7.0 GPM |
| | | 60708-00..... | DLFC, 1"F x 3/4"F, NPT, No Button |
| | | 60708-8.0..... | DLFC, 1"F x 3/4"F, NPT, 8.0 GPM |
| | | 60708-9.0..... | DLFC, 1"F x 3/4"F, NPT, 9.0 GPM |
| | | 60708-10..... | DLFC, 1"F x 3/4"F, NPT, 10.0 GPM |
| | | 60708-12..... | DLFC, 1"F x 3/4"F, NPT, 12.0 GPM |
| | | 60708-15..... | DLFC, 1"F x 3/4"F, NPT, 15.0 GPM |
| | | 60721-00..... | DLFC, 1"F x 1"F, NPT, No Button |
| | | 60721-06..... | DLFC, 1"F x 1"F, NPT, 0.06 GPM |
| | | 60721-08..... | DLFC, 1"F x 1"F, NPT, 0.08 GPM |
| | | 60721-10..... | DLFC, 1"F x 1"F, NPT, 1.0 GPM |
| | | 60721-12..... | DLFC, 1"F x 1"F, NPT, 1.2 GPM |
| | | 60721-13..... | DLFC, 1"F x 1"F, NPT, 1.3 GPM |
| | | 60721-15..... | DLFC, 1"F x 1"F, NPT, 1.5 GPM |
| | | 60721-00..... | DLFC, 1"F x 1"F, NPTF, No Button |
| | | 60721-17..... | DLFC, 1"F x 1"F, NPTF, 1.7 GPM |
| | | 60721-20..... | DLFC, 1"F x 1"F, NPTF, 2.0 GPM |
| | | 60721-24..... | DLFC, 1"F x 1"F, NPTF, 2.4 GPM |
| | | 60721-30..... | DLFC, 1"F x 1"F, NPTF, 3.0 GPM |
| | | 60721-35..... | DLFC, 1"F x 1"F, NPTF, 3.5 GPM |
| | | 60721-40..... | DLFC, 1"F x 1"F, NPTF, 4.0 GPM |
| | | 60721-45..... | DLFC, 1"F x 1"F, NPTF, 4.5 GPM |
| | | 60721-50..... | DLFC, 1"F x 1"F, NPTF, 5.0 GPM |
| | | 60721-60..... | DLFC, 1"F x 1"F, NPTF, 6.0 GPM |
| | | 60721-70..... | DLFC, 1"F x 1"F, NPTF, 7.0 GPM |
| | | 60702-00..... | DLFC, 1"M x 1"F, NPT, Brass, No Button |
| | | 60702-8.0..... | DLFC, 1"M x 1"F, NPT, 8.0 GPM |
| | | 60702-9.0..... | DLFC, 1"M x 1"F, NPT, 9.0 GPM |
| | | 60702-10..... | DLFC, 1"M x 1"F, NPT, 10 GPM |
| | | 60702-12..... | DLFC, 1"M x 1"F, NPT, 12 GPM |
| | | 60702-15..... | DLFC, 1"M x 1"F, NPT, 15 GPM |

1600 BRINE VALVE SYSTEM (FOR 9500)



| Item No. | QTY | Part No. | Description |
|----------|---------|----------------|--|
| 1..... | 1 | 16960..... | Tube, Brine Valve |
| | 1 | 16960..... | Tube, Brine Valve, HW |
| 2..... | 1 | 10329..... | Fitting, Tube, 3/8 Nut, Brass |
| | | 18698..... | Nut, 3/8" TUBE, W/Sleeve, HW |
| 3..... | 1 | 10330..... | Fitting, Sleeve, 3/8 Celcon |
| 4..... | 1 | 10332..... | Fitting, Insert, 3/8 |
| 5..... | 1 | 12747..... | Fitting, Flow Control |
| | | 60020-25..... | BLFC, 0.25 GPM, 1600 |
| | | 60020-50..... | BLFC, 0.50 GPM, 1600 |
| | | 60020-100..... | BLFC, 1.0 GPM, 1600 |
| 6..... | 1 | 12550-01..... | Quad Ring, -009, 560CD |
| 7..... | 1 | 12626-01..... | Seat, Brine Valve, 560CD |
| 8..... | 1 | 16958..... | Brine Valve Stem, 1600 Coated |
| 9..... | 1 | 11982-01..... | O-ring, -016, 560CD |
| 10..... | 3 | 15137..... | Screw, Hex Washer Mach, 10-24 x 3/8 |
| 11..... | 3 | 10269..... | Nut, Jam, 3/84 - 16 |
| 12..... | 3 | 16922..... | Bracket, Brine Valve Mounting |
| 13..... | 1 | 10250..... | Ring, Retaining |
| 14..... | 1 | 10249..... | Spring, Brine Valve |
| 15..... | 1 | 12748-01..... | Brine Valve Body, 1600 |
| 16..... | 2 | 10328..... | Fitting, Elbow, 90 Deg. |
| 17..... | | 60037-610..... | Brine Valve Assy. 9500/1600 0.25 GPM |
| | | 60037-620..... | Brine Valve Assy. 9500/1600 0.50 GPM |
| | | 60037-630..... | Brine Valve Assy. 9500/1600 1.0 GPM |
| | | 60037HW..... | Brine Valve Assy. 9500/1600 Hot Water |

1700 BRINE VALVE SYSTEM (FOR 9500)

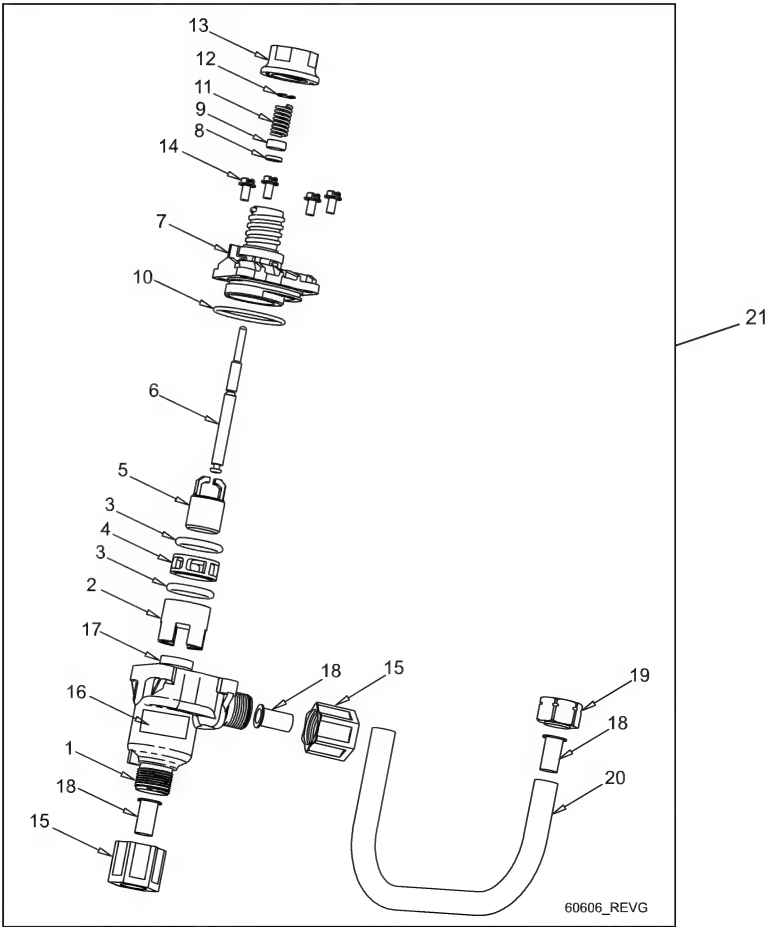


60039_REVA

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|---|
| 1..... | 1 | 14792..... | Plug, End, Brine Valve |
| 2..... | 1 | 13201..... | Quad Ring, -020 |
| | | 13201-01..... | Quad Ring, -020, 560CD |
| 3..... | 1 | 12550..... | Quad Ring, -009 |
| | | 12550-01..... | Quad Ring, -009, 560CD |
| 4..... | 1 | 14785-01..... | Retainer, Flow Control |
| 5..... | 2 | 14811..... | O-ring, -210, 560CD, Brine |
| 6..... | 1 | 14795..... | Piston, Brine Valve |
| 7..... | 1 | 16929..... | Brine Valve Stem, Coated |
| 8..... | 1 | 15415..... | Fitting, Insert, 1/2" Tube |
| 9..... | 1 | 16124..... | Fitting, Sleeve, Delrin |
| 10..... | 1 | 16123..... | Nut, Brass |
| 11..... | 1 | 15137..... | Screw, Hex Washer Mach, 10-24 x 3/8 |
| 12..... | 1 | 10269..... | Nut, Jam, 3/4 - 16 |
| 13..... | 1 | 16922..... | Bracket, Brine Valve Mounting |
| 14..... | 2 | 10250..... | Ring, Retaining |
| 15..... | 1 | 15310..... | Spring, Brine Valve |
| 16..... | 2 | 14790..... | Brine Valve Body |
| 17..... | 1 | 14798..... | Spacer, 1700, Brine |
| 18..... | 1 | 15414..... | Nut, 2900, w/Sleeve |
| 19..... | 1 | 15413..... | Fitting, Elbow, Male, 1/2T x 3/8 NPT |
| 20..... | 1 | 16959..... | Tube, Brine 9500/1710, 10.6" |
| | | 16959-01..... | Tube, Brine Valve 9500/1710, CPVC, Hot Water |

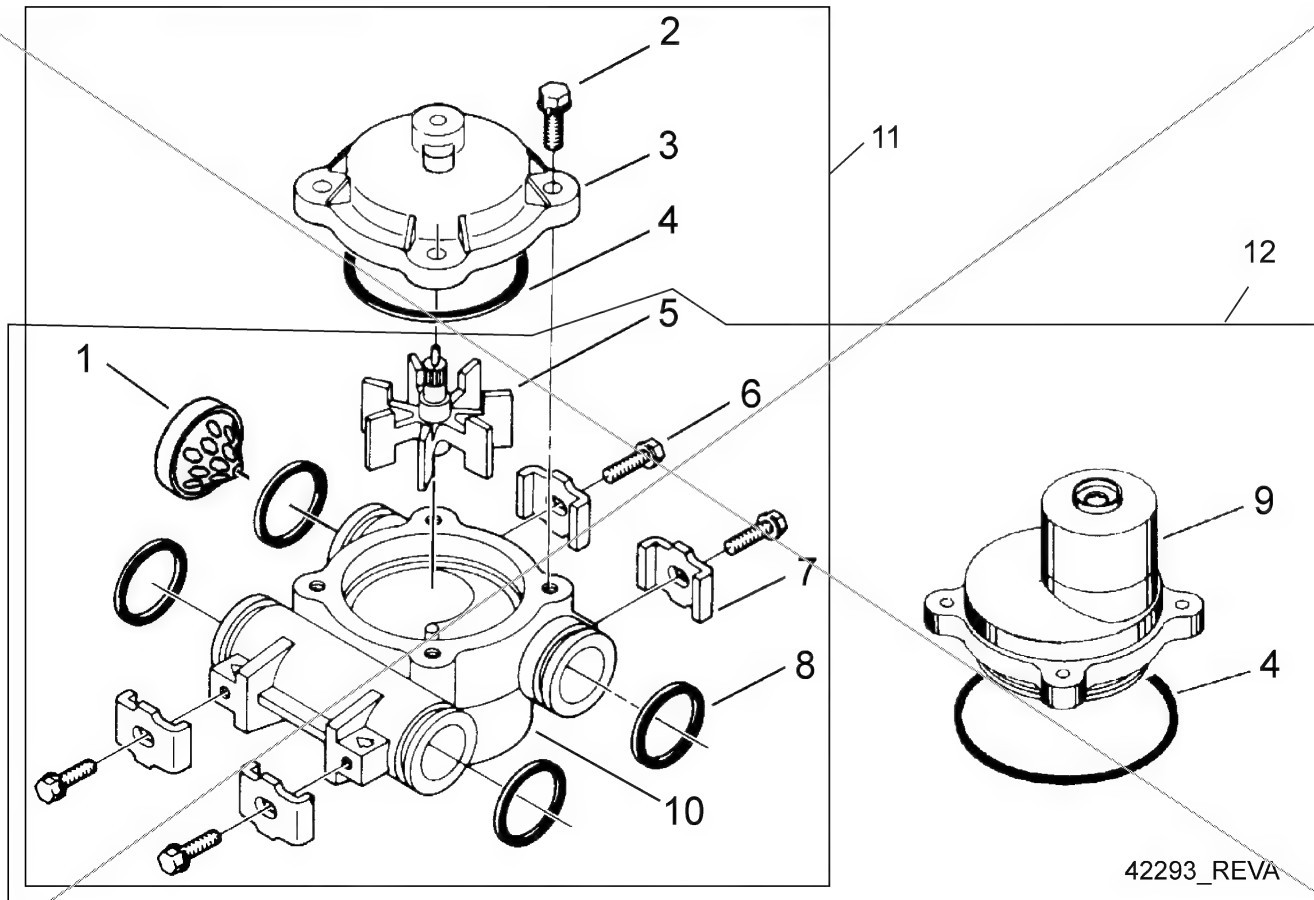
| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|--|
| 21..... | | 60039-10..... | Brine Valve Assy. 9500/1700 1.0 GPM |
| | | 60039-12..... | Brine Valve Assy. 9500/1700 1.2 GPM |
| | | 60039-15..... | Brine Valve Assy. 9500/1700 1.5 GPM |
| | | 60039-20..... | Brine Valve Assy. 9500/1700 2.0 GPM |
| | | 60039-24..... | Brine Valve Assy. 9500/1700 2.4 GPM |
| | | 60039-30..... | Brine Valve Assy. 9500/1700 3.0 GPM |
| | | 60039-50..... | Brine Valve Assy. 9500/1700 5.0 GPM |
| | | 60039-00..... | Brine Valve Assy. 9500/1700 Blank |
| 22..... | | 12097..... | Washer, Flow, 1.0 GPM |
| | | 12085..... | Washer, Flow, 1.2 GPM |
| | | 19150..... | Washer, Flow, 1.3 GPM |
| | | 12086..... | Washer, Flow, 1.5 GPM |
| | | 19149..... | Washer, Flow, 1.7 GPM |
| | | 12087..... | Washer, Flow, 2.0 GPM |
| | | 12088..... | Washer, Flow, 2.4 GPM |
| | | 12089..... | Washer, Flow, 3.0 GPM |
| | | 12090..... | Washer, Flow, 3.5 GPM |
| | | 12091..... | Washer, Flow, 4.0 GPM |
| | | 19147..... | Washer, Flow, 4.5 GPM |
| | | 12092..... | Washer, Flow, 5.0 GPM |
| | | 17814..... | Washer, Flow, 6.0 GPM |
| | | 12408..... | Washer, Flow, 7.0 GPM |

1710 BRINE VALVE SYSTEM (FOR 9500)



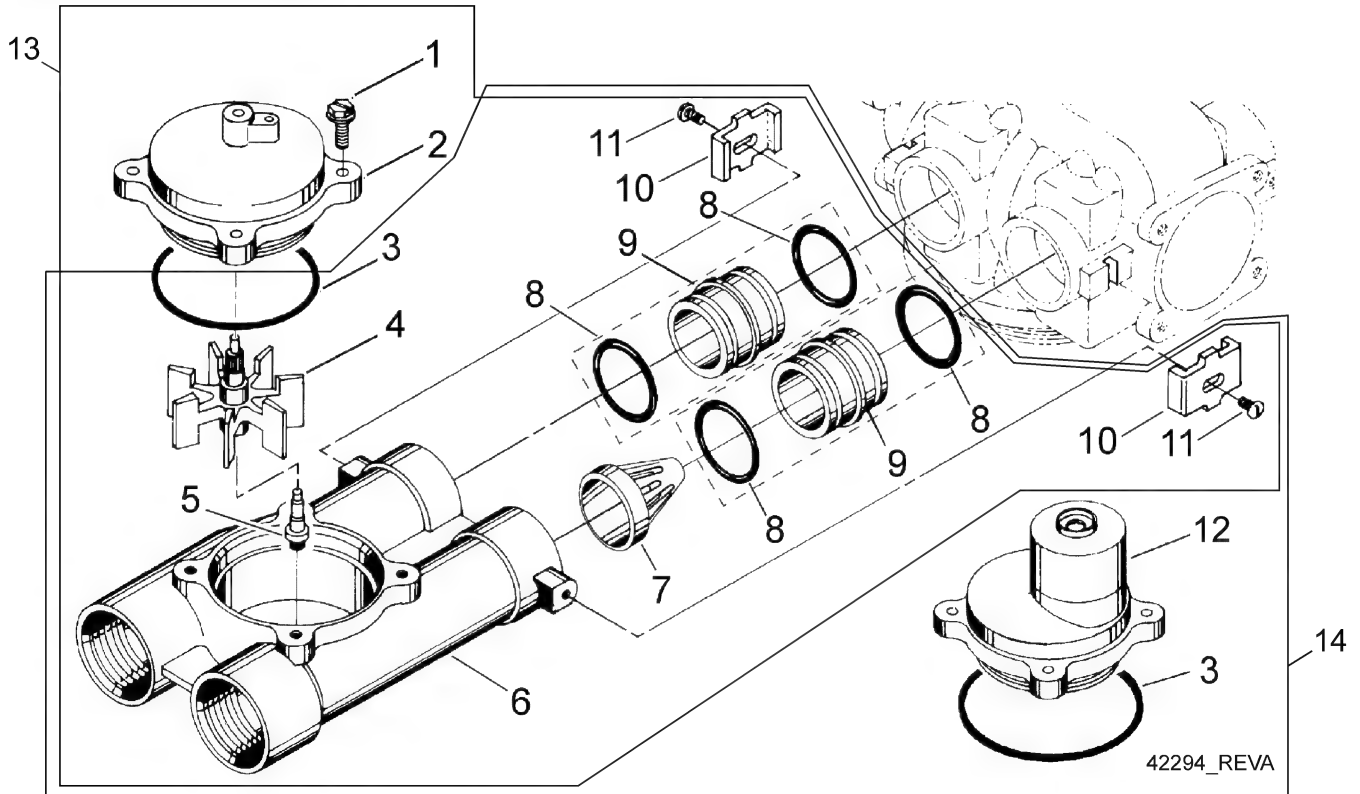
| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-----|---------------|---------------------------------------|----------|-----|---------------|-------------------------------------|
| 1..... | 1 | 41202..... | Brine Valve, 1700, Plastic, Top | 21..... | 1 | 60606-10..... | Brine Valve Assy. 9500/1710 1.0 GPM |
| 2..... | 1 | 14785-01..... | Retainer, Flow Control | ..... | 1 | 60606-12..... | Brine Valve Assy. 9500/1710 1.2 GPM |
| 3..... | 2 | 14811..... | O-ring, -210, 560CD, Brine | ..... | 1 | 60606-15..... | Brine Valve Assy. 9500/1710 1.5 GPM |
| 4..... | 1 | 14798..... | Spacer, 1700, Brine | ..... | 1 | 60606-20..... | Brine Valve Assy. 9500/1710 2.0 GPM |
| 5..... | 1 | 14795..... | Piston, Brine Valve | ..... | 1 | 60606-24..... | Brine Valve Assy. 9500/1710 2.4 GPM |
| 6..... | 1 | 41429..... | Stem, Brine, 1710, Plastic, 9500 | ..... | 1 | 60606-30..... | Brine Valve Assy. 9500/1710 3.0 GPM |
| 7..... | 1 | 41201..... | Brine Valve, 1700, Plastic, Bottm | ..... | 1 | 60606-40..... | Brine Valve Assy. 9500/1710 4.0 GPM |
| 8..... | 1 | 12550..... | Ring, Quad, -009 | ..... | 1 | 60606-50..... | Brine Valve Assy. 9500/1710 5.0 GPM |
| 9..... | 1 | 17908..... | Sleeve, Brine Valve Stem | ..... | 1 | 60606-00..... | Brine Valve Assy. 9500/1710 Blank |
| 10..... | 1 | 41547..... | O-ring, 2mm x 35mm | | | | |
| 11..... | 1 | 15310..... | Spring, Brine Valve | | | | |
| 12..... | 1 | 10250..... | Ring, Retaining | | | | |
| 13..... | 1 | 17906-01..... | Guide, Brine Valve Stem | | | | |
| 14..... | 4 | 14202-01..... | Screw, Hex Washer, Mach, 8-32 x 5/16" | | | | |
| 15..... | 2 | 41056..... | Nut Assy, 1/2" Plastic | | | | |
| 16..... | 1 | 41493-XX..... | Label, BLFC, 1710 (Specify GPM) | | | | |
| 17..... | 1 | | Washer, Flow (Specify GPM) | | | | |
| 18..... | 3 | 15415..... | Fitting, Insert, 1/2", Tube | | | | |
| 19..... | 1 | 15414..... | Nut, 2900, w/Sleeve | | | | |
| 20..... | 1 | 16959..... | Tube, Brine 9500/1700, 10.6" | | | | |

3/4" METER ASSEMBLY



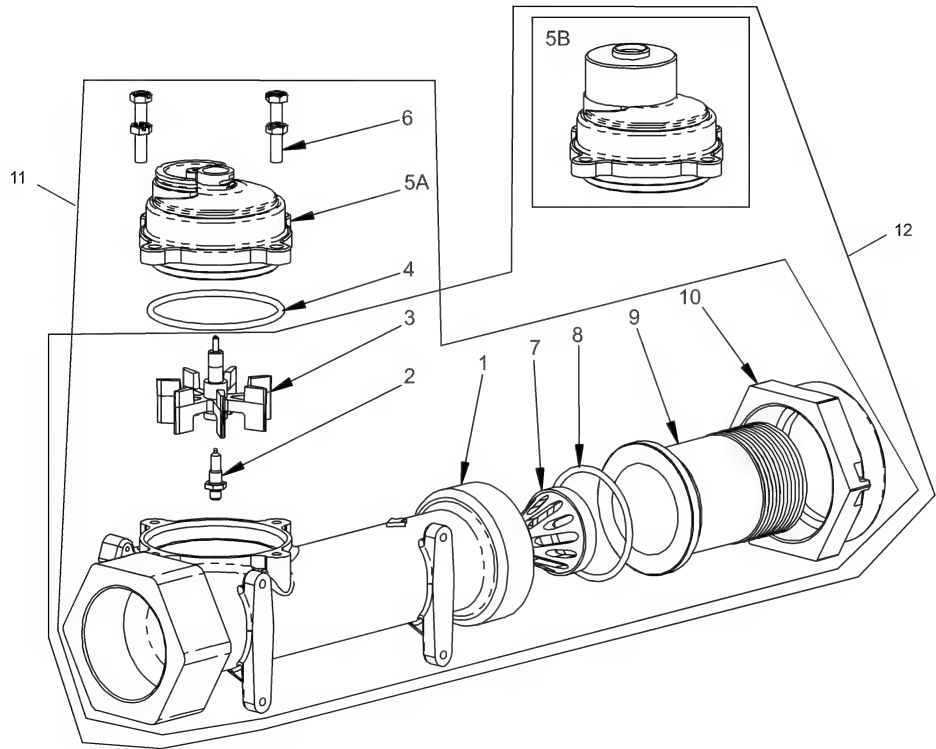
| Item No. | QTY | Part No. | Description |
|----------|-----|----------|---|
| 1.....1 | 1 | 14613 | Flow Straightener |
| 2.....4 | 4 | 12473 | Screw, Hex Washer, 10-24 x 5/8 |
| 3.....1 | 1 | 14038 | Meter Cap Assy, STD, Plastic |
| 4.....1 | 1 | 13847 | O-ring, -137, Std/560CD, Meter |
| 5.....1 | 1 | 13509 | Impeller, Meter |
| 6.....4 | 4 | 13314 | Screw, Slot Ind Hex, 8-18 x .60 |
| 7.....4 | 4 | 13255 | Clip, Mounting |
| 8.....4 | 4 | 13305 | O-ring, -119 |
| 9.....1 | 1 | 15150 | Meter Cap Assy, EXT, Plastic Paddle |
| 10.....1 | 1 | 13821 | Body, Meter, 5600 |
| 11.....1 | 1 | 60086 | Meter Assy, 3/4" Dual Port, Slip, STD, Plastic, Paddlewheel, w/ Clips |
| 12.....1 | 1 | 60087 | Meter Assy, 3/4" Dual Port, Slip, EXT, Plastic, Paddlewheel, w/ Clips |

1" METER ASSEMBLY



| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|--------|----------------|--|----------|-----------------|----------|---|
| 1..... | 4..... | 12112..... | Screw, Hex Hd Mach 10-24 x 1/2 | ..... | 60389-001..... | | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, 560CD, PDL, W/ CLPS |
| 2..... | 1..... | 15218..... | Meter Cap Assy, Brass, Standard | ..... | 60389-001NP.... | | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, 560CD, PDL, W/ CLPS |
| | | 14038..... | Meter Cap Assy, Standard | ..... | 60389NP..... | | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, NP, PDL, W/ CLPS |
| 3..... | 1..... | 13847..... | O-ring, -137, STD/560CD, Meter | ..... | 60612..... | | Meter Assy, 1" Dual Port, NPT, STD, BRS, HW, PDL |
| 4..... | 1..... | 13509..... | Impeller, Meter | ..... | 60612NP..... | | Meter Assy, 1" Dual Port, NPT, STD, BRS, HW, NP, PDL |
| | | 13509-01..... | Impeller, Celcon | ..... | 61575..... | | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, PDL, W/O CLP & SCW |
| 5..... | 1..... | 13882..... | Post, Meter Impeller | ..... | 60389-20..... | | Meter Assy, 1" Dual Port, BSP/ Metric, STD, BRS BDY, PDL, W/ CLPS |
| 6..... | 1..... | 15043..... | Body, Meter, 9000 1" | ..... | 60390-20..... | | Meter Assy, 1" Dual Port, BSP/ Metric, EXT, BRS BDY, PDL, W/ CLPS |
| 7..... | 1..... | 14960..... | Flow Straightener, 1" | ..... | 60632-20..... | | Meter Assy, 1" Dual Port, BSP/ Metric, EXT, BRS, HW, PDL |
| 8..... | 4..... | 13305..... | O-ring, -119 | ..... | 60612-20..... | | Meter Assy, 1" Dual Port, BSP/ Metric, STD, BRS, HW, PDL |
| 9..... | 2..... | 15078..... | Adapter, 1" Coupling | | | | |
| 10..... | 2..... | 13255..... | Clip, Mounting | | | | |
| 11..... | 2..... | 14202-01..... | Screw, Hex Washer Mach, 8-32 x 5/16 | | | | |
| 12..... | 1..... | 15150..... | Meter Cap Assy, Ext, Plastic Paddle | | | | |
| | | 15237..... | Meter Cap Assy, Ext, Brass Paddle | | | | |
| 13..... | | 60390..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS BDY, PDL, W/CLPS | | | | |
| | | 60390-001..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS BDY, 560CD, PDL, W/ CLPS | | | | |
| | | 60390NP..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS BDY, NP, PDL, W/ CLPS | | | | |
| | | 60632..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS, HW, PDL | | | | |
| | | 60632NP..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS, HW, NP, PDL | | | | |
| | | 60389..... | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, PDL, W/CLPS | | | | |

1-1/2" METER ASSEMBLY



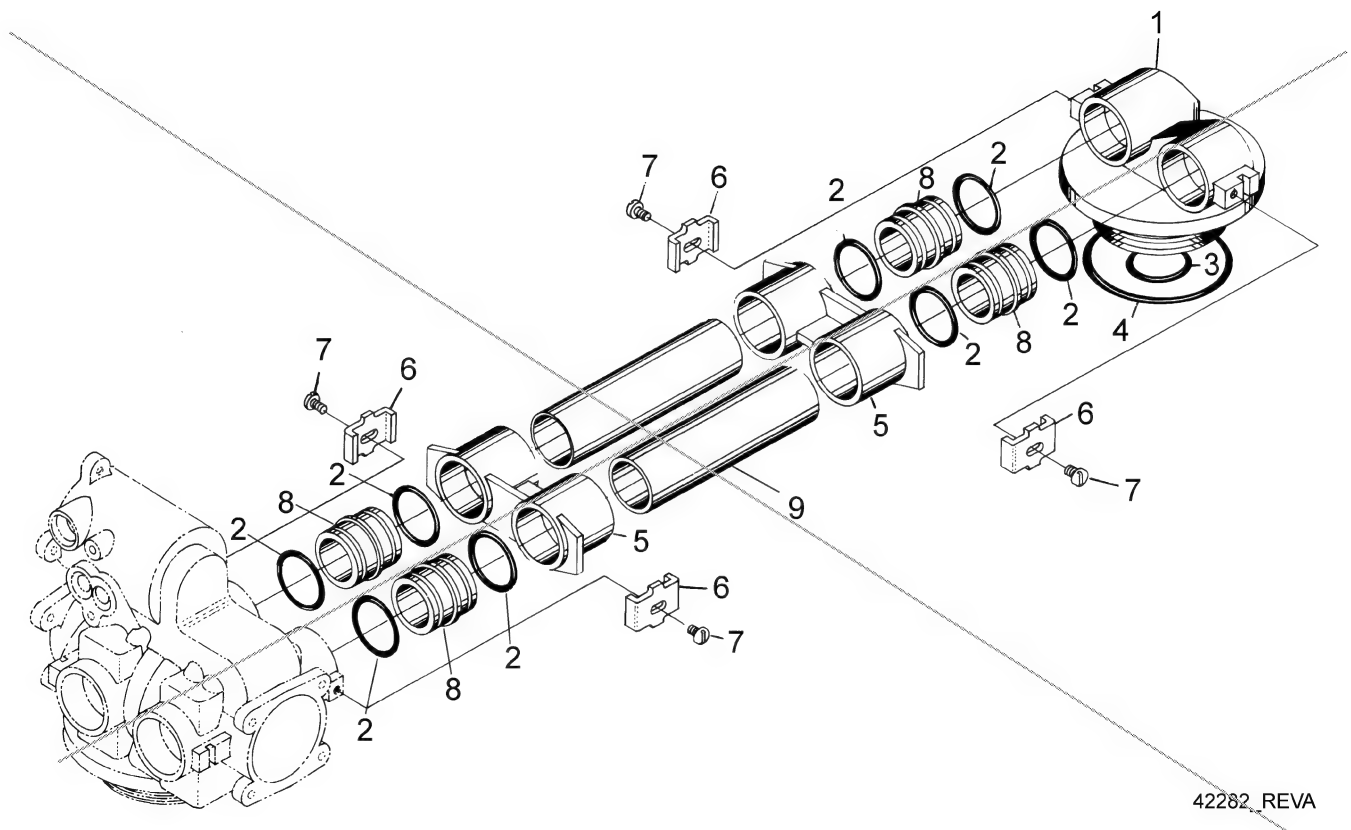
60610 Rev C

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|--|
| 1..... | 1 | 17569..... | Body, Meter, 2850/9500 |
| 2..... | 1 | 13882..... | Post, Meter Impeller |
| 3..... | 1 | 13509..... | Impeller, Meter |
| | 1 | 13509-01..... | Impeller, Celcon, Hot Water |
| 4..... | 1 | 13847..... | O-Ring, -137, Std/560CD, Meter |
| 5A..... | 1 | 14038..... | Meter Cap Assy, STD Range, Plastic |
| 5B..... | 1 | 15150..... | Meter Cap Assy, Ext Range, Plastic |
| 6..... | 4 | 12112..... | Screw, Hex Hd Mach, 10-24 x 1/2 18-8 Stainless Steel |
| 7..... | 1 | 17542..... | Flow Straightener, 1-1/2" |
| 8..... | 1 | 12733..... | O-Ring, -132 |
| 9..... | 1 | 17544..... | Fitting, 1-1/2" Quick Connector |
| 10..... | 1 | 17543..... | Nut, 1-1/2", Q/C |
| 11..... | | 60610-01..... | Meter Assy, 1-1/2", NPT, STD, Brass, Paddlewheel |
| | | 60610-21..... | Meter Assy, 1-1/2", BSP, STD, Brass, Paddlewheel |
| 12..... | | 60610-02..... | Meter Assy, 1-1/2", NPT, STD, Brass Paddlewheel |
| | | 60610-22..... | Meter Assy, 1-1/2", BSP, EXT, Brass, Paddlewheel |

Not Shown

| | | |
|--------|------------|---|
| 1..... | 17790..... | Sleeve, Meter, 1 1/2" x 1" |
| 1..... | 15218..... | Meter Cap Assy, STD Range, Brass, Hot Water |
| 1..... | 15237..... | Meter Cap Assy, EXT Range, Brass, Hot Water |
| | | Sleeve, Meter, 1.5" x 1" |

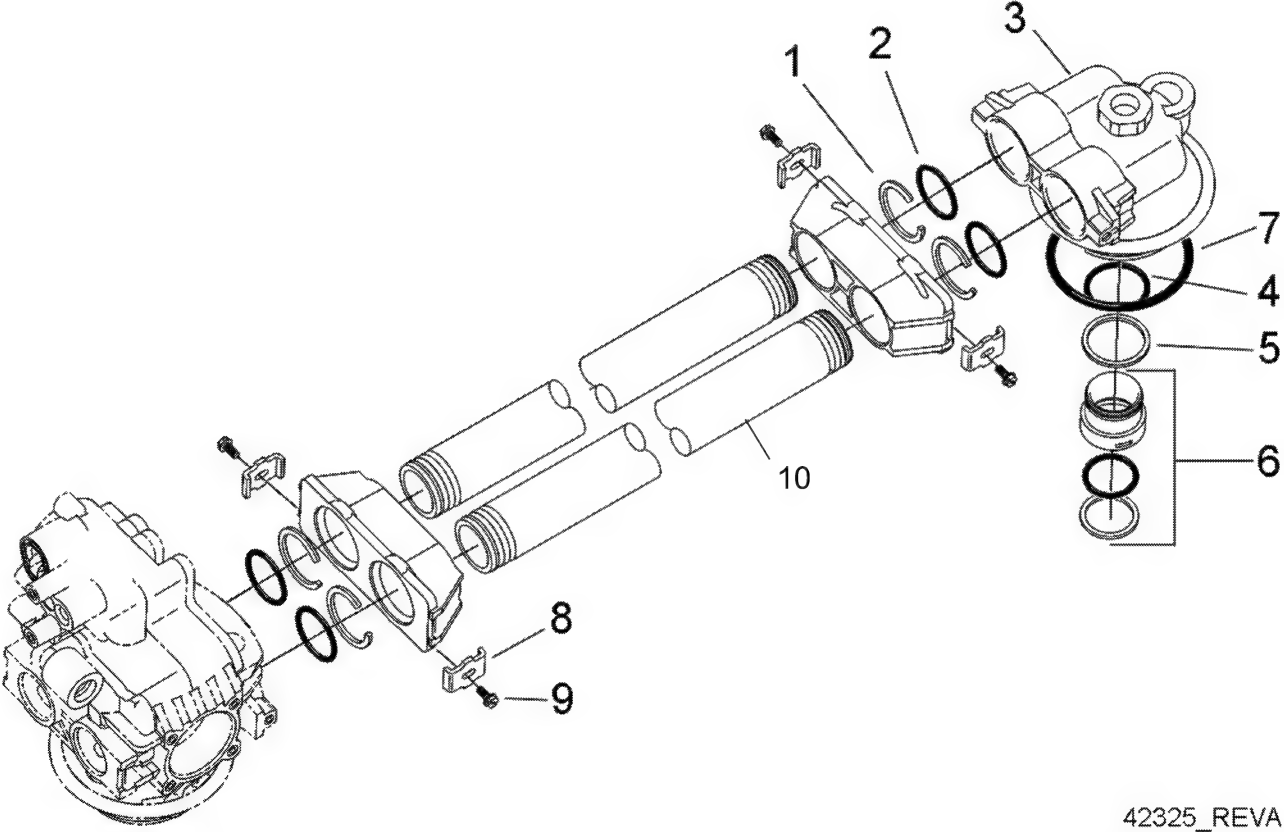
9000 SECOND TANK ASSEMBLY



42282_REVA

| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|---|
| 1..... | 1 | 14864-01..... | Adapter, 9000, 2nd Tank, Machd w/O-rings |
| 2..... | 8 | 13305..... | O-ring, -119 |
| 3..... | 1 | 11710..... | O-ring, -215 |
| 4..... | 1 | 12281..... | O-ring, -338 |
| 5..... | 2 | 13708-40..... | Yoke, 1" Sweat |
| ..... | 1 | 15823-XX..... | Yoke Assy. Specify Tank Size |
| 6..... | 4 | 13255..... | Clip, Mounting |
| 7..... | 4 | 14202-01..... | Screw, Hex Washer Mach, 8-32 x 5/16 |
| 8..... | 4 | 15078..... | Adapter, 1" Coupling |
| 9..... | | 15823-06..... | 9000 Tube Assy, 6" Dia. Tank Only (Overall Length 7.25) |
| ..... |  | 15823-06NP..... | 9000 Tube Assy, 6" Dia. Tank Only (Overall Length 7.25) |
| ..... |  | 15823-12..... | 9000 Tube Assy, 6" to 12" Dia. Tank (Overall Length 9.75) |
| ..... |  | 15823-12NP..... | 9000 Tube Assy, 6" to 12" Dia. Tank (Overall Length 9.75) |
| ..... |  | 15823-14..... | 9000 Tube Assy, 14" Dia. Tank (Overall Length 11.75) |
| ..... |  | 15823-14NP..... | 9000 Tube Assy, 14" Dia. Tank (Overall Length 11.75) |
| ..... |  | 15823-16..... | 9000 Tube Assy, 16" Dia. Tank (Overall Length 13.75) |
| ..... |  | 15823-16NP..... | 9000 Tube Assy, 16" Dia. Tank (Overall Length 13.75) |

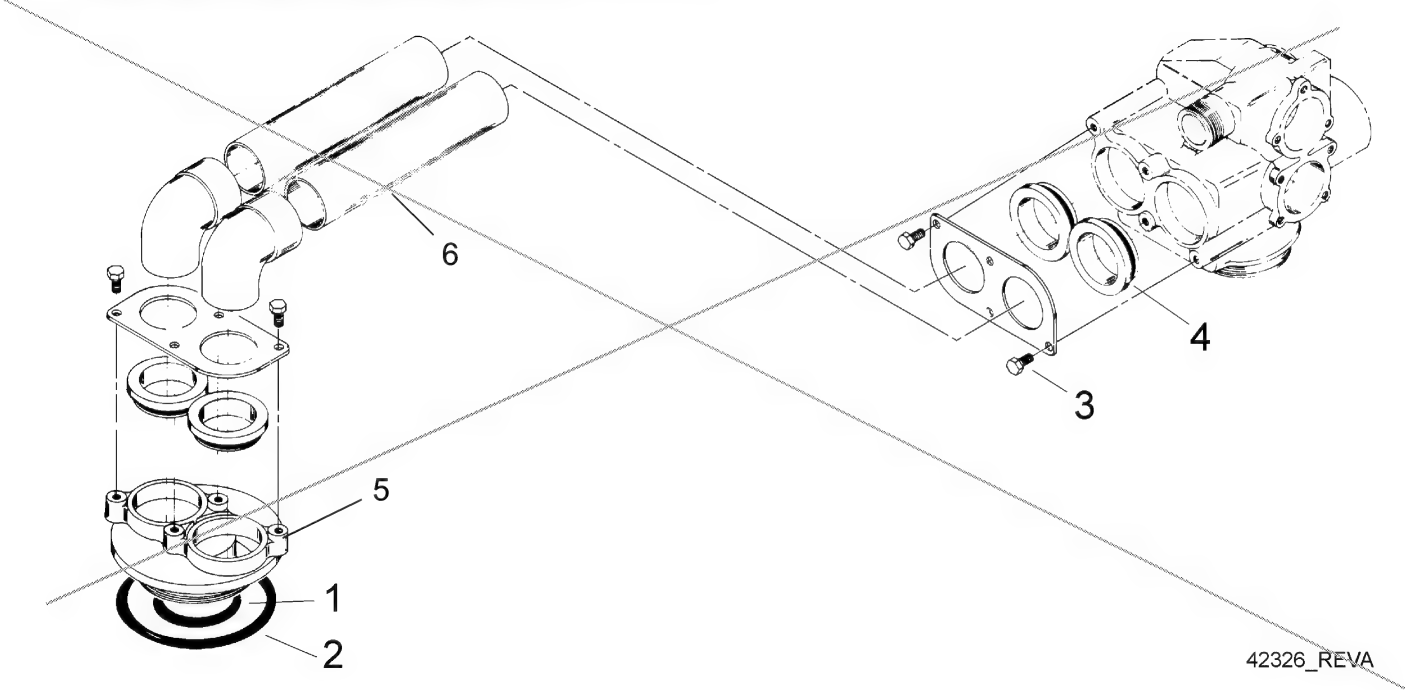
9100 SECOND TANK ASSEMBLY



42325_REVA

| Item No. | QTY | Part No. | Description |
|----------|---------|---------------------|-------------------------------------|
| 1..... | 4 | 40678..... | Ring, 9100, Yoke Retainer |
| 2..... | 4 | 13287..... | O-ring, -123 |
| 3..... | 1 | 14865..... | Adapter Assy, 2nd Tank, 9100 |
| 4..... | 1 | 19054..... | O-ring, -124 |
| 5..... | 1 | 40538..... | Retainer, 32mm, O-ring Dist, 7000 |
| 6..... | 1 | 61419..... | Kit, 1.05" Distributor, Adapter |
| 7..... | 1 | 18303..... | O-ring, -336 |
| 8..... | 4 | 13255..... | Clip, Mounting |
| 9..... | 4 | 14202-01..... | Screw, Hex Washer Mach, 8-32 x 5/16 |
| 10..... | | 60425-9..... | Tube Assy, 9100 8-9" Tank |
| | | 60425-12..... | Tube Assy, 9100 6-12" Tank |
| | | 60425-16..... | Tube Assy, 9100 13-16" Tank |

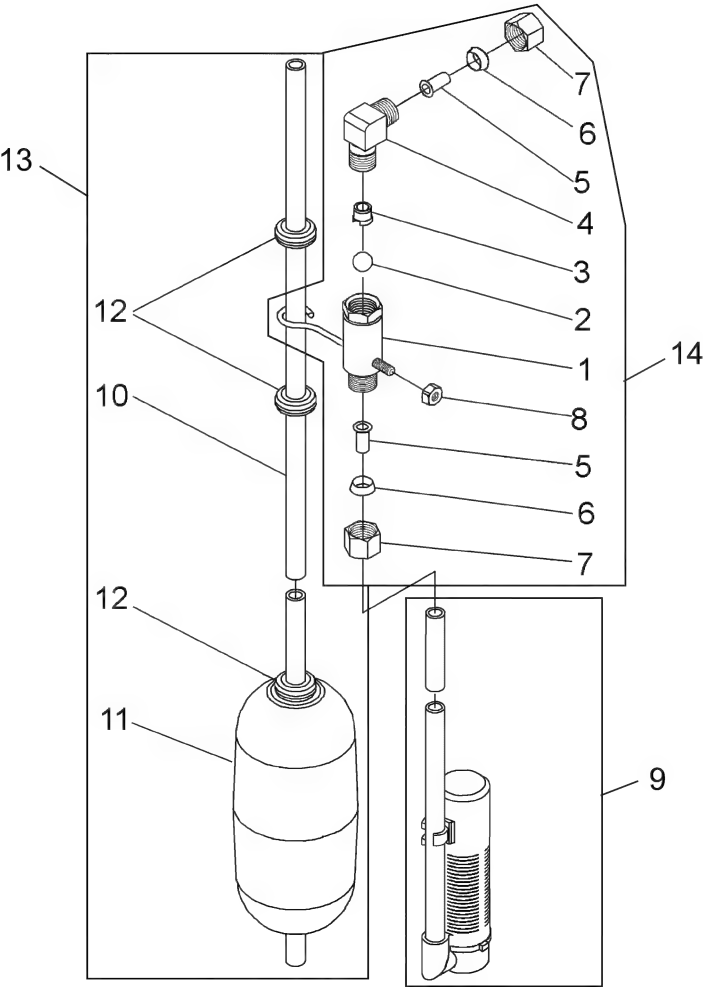
9500 SECOND TANK ASSEMBLY



42326_REVA

| Item No. | QTY | Part No. | Description |
|----------|---------|-----------------------|---|
| 1..... | 1 | 13577 | O-ring, -226 |
| 2..... | 1 | 16455 | O-ring, -347 |
| 3..... | 8 | 10231 | Screw, Slot Hex, 1/4 - 20 x 1/2 |
| 4..... | 4 | 17224 | O-ring, -224 |
| 5..... | 1 | 16916-01..... | Adapter, 9500, 2nd Tank, NPT |
| | | 16916-21..... | Adapter, 9500, 2nd Tank, Metric |
| | | 16916-01NP..... | Adapter, 9500, 2nd Tank, NPT, Nickel Plated |
| 6..... | | 17465-16..... | Tube Assy, 2nd Tank, 16" 9500 |
| | | 17465-16NP..... | Tube Assy, 2nd Tank, 16" 9500 Nickel Plated |
| | | 17465-20..... | Tube Assy, 2nd Tank, 20" 9500 |
| | | 17465-24..... | Tube Assy, 2nd Tank, 24" 9500 |
| | | 17465-24NP..... | Tube Assy, 2nd Tank, 24" 9500 Nickel Plated |

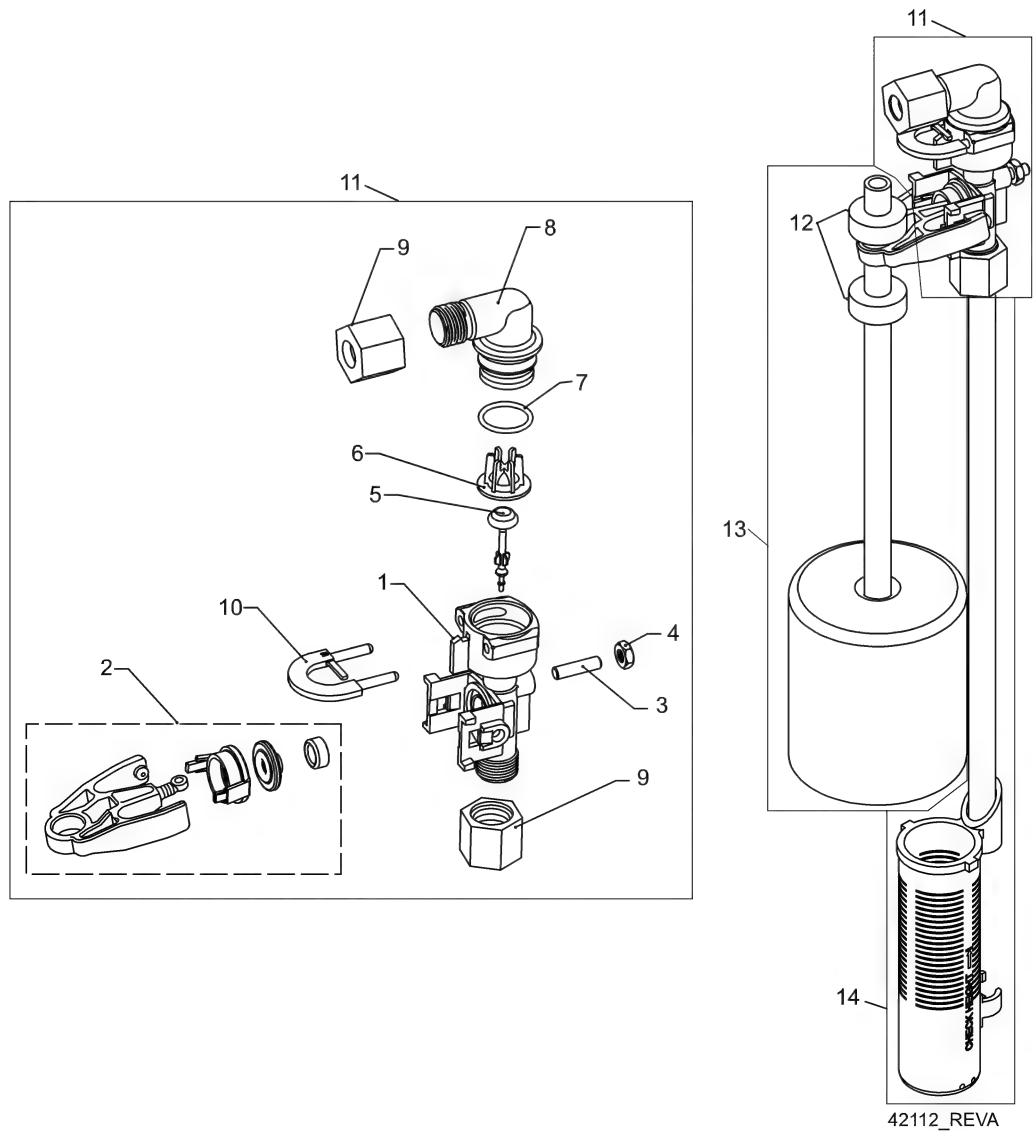
2300 SAFETY BRINE VALVE



60027 Rev D

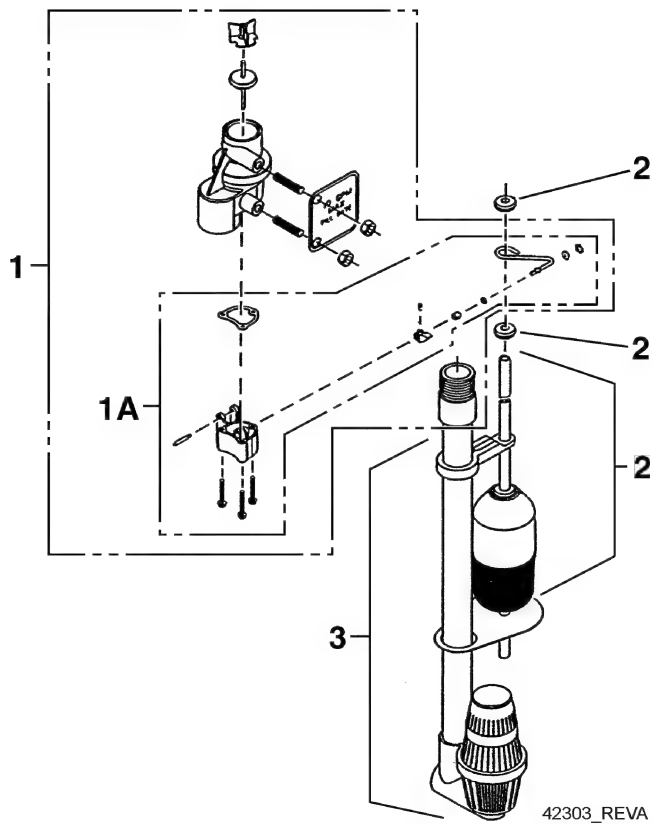
| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-------|------------------|--|----------|-------|----------------|--|
| 1.....1 | | 60027-00..... | Safety Brine Valve, 2300, Less Elbow | 11.....1 | ..... | 10700..... | Float Assy, White |
| 2.....1 | | 10138..... | Ball, 3/8", Brass | 12.....3 | ..... | 10150..... | Grommet, .30 Dia |
| 3.....1 | | 11566..... | Ball Stop, Slow Fill | 13.....1 | ..... | 60028-30..... | Float Assy, 2300, 30" White |
| 4.....1 | | 10328..... | Fitting, Elbow, 90 Deg. 1/4 NPT x 3/8 Tube | 14.....1 | ..... | 60027-FFA..... | Safety Brine Valve, 2300, Fitting Facing Arm |
| 5.....1 | | 10332..... | Fitting, Insert, 3/8 | 1..... | ..... | 60027-FFS..... | Safety Brine Valve, 2300 Fitting Facing Stud |
| 6.....1 | | 10330..... | Fitting, Sleeve, 3/8 Celcon | | | | |
| 7.....1 | | 10329..... | Fitting, Tube, 3/8 Nut, Brass | | | | |
| 8.....1 | | 10186..... | Nut, Hex, 10-32 | | | | |
| 9.....1 | | 60002-10..... | Air Check, #500, American Hydro | | | | |
| | | 60002-11.38..... | Air Check, #500, 11.38" Long | | | | |
| | | 60002-24..... | Air Check, #500, 24" Long | | | | |
| | | 60002-27..... | Air Check, #500, 27" Long | | | | |
| | | 60002-32..... | Air Check, #500, 32" Long | | | | |
| | | 60002-34..... | Air Check, #500, 34" Long | | | | |
| | | 60002-36..... | Air Check, #500, 36" Long | | | | |
| | | 60002-48..... | Air Check, #500, 48" Long | | | | |
| | | 60002-26.25..... | Air Check, #500, 26.25" Long | | | | |
| | | 60002-33.25..... | Air Check, #500, 33.25" Long | | | | |
| 10.....1 | | 10149..... | Rod, Float, 30" | | | | |

2310 SAFETY BRINE VALVE



| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|----------------------------------|----------|-----|------------------|---------------------------------|
| 1..... | 1 | 19645..... | Body, Safety Brine Valve, 2310 | 14..... | 1 | 60002-10..... | Air Check, #500, American Hydro |
| 2..... | 1 | 19803..... | Safety Brine Valve Assy | ..... |  | 60002-11.38..... | Air Check, #500, 11.38" Long |
| 3..... | 1 | 19804..... | Screw, Sckt Hd, Set, 10-24 x .75 | ..... |  | 60002-24..... | Air Check, #500, 24" Long |
| 4..... | 1 | 19805..... | Nut, Hex, 10-24, Nylon Black | ..... |  | 60002-27..... | Air Check, #500, 27" Long |
| 5..... | 1 | 19652-01..... | Poppet Assy, SBV w/O-ring | ..... |  | 60002-32..... | Air Check, #500, 32" Long |
| 6..... | 1 | 19649..... | Flow Dispenser | ..... |  | 60002-34..... | Air Check, #500, 34" Long |
| 7..... | 1 | 11183..... | O-ring, -017 | ..... |  | 60002-36..... | Air Check, #500, 36" Long |
| 8..... | 1 | 19647..... | Elbow, Safety Brine Valve | ..... |  | 60002-48..... | Air Check, #500, 48" Long |
| 9..... | 2 | 19625..... | Nut Assy, 3/8" Plastic | ..... |  | 60002-26.25..... | Air Check, #500, 26.25" Long |
| 10..... | 1 | 18312..... | Retainer, Drain | ..... |  | 60002-33.25..... | Air Check, #500, 33.25" Long |
| 11..... | 1 | 60014..... | Safety Brine Valve Assy, 2310 | | | | |
| 12..... | 2 | 10150..... | Grommet, .30 Dia | | | | |
| 13..... | 1 | 60068-8.06..... | Float Assy, 2310, w/8.06" Rod | | | | |
| | | 60068-10.5..... | Float Assy, 2310, w/10.5" Rod | | | | |
| | | 60068-11.5..... | Float Assy, 2310, w/11.5" Rod | | | | |
| | | 60068-20..... | Float Assy, 2310, w/20" Rod | | | | |
| | | 60068-30..... | Float Assy, 2310, w/30" Rod | | | | |

2350 SAFETY BRINE VALVE

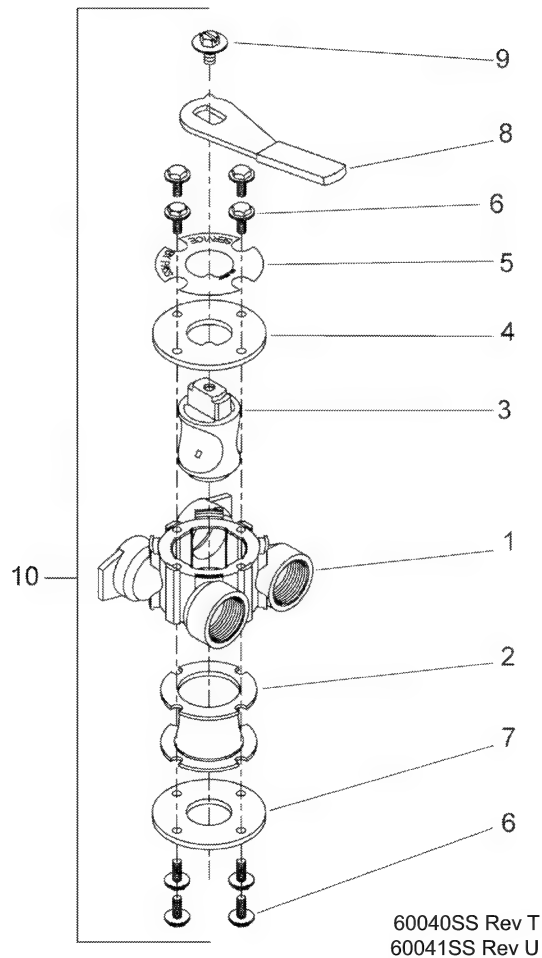


| Item No. | QTY | Part No. | Description |
|----------|---------|-----------------|---|
| 1..... | 1 | 60038 | Safety Brine Valve, 2350 |
| 1A | 1 | 61024 | Actuator Assy, 2350 Brine |
| 2..... | 1 | 60028-30..... | Float Assy, 2350, 30" Wht |
| ..... | 1 | 60026-30SAN ... | Float Assy, 2350, 30" Hot Water |
| 3..... | 1 | 60009-00..... | Air Check, #900, Commercial Less Fittings |
| ..... | 1 | 60009-01..... | Air Check, #900, Commercial, Hot Water Less Fittings |

Not Shown

| | | | |
|-------|---------|-------------|----------------------------------|
| ..... | 1 | 18603 | Fitting Assy, 900 Air Check 2350 |
| ..... | 1 | 18602..... | Fitting Assy, 900 Air Check |

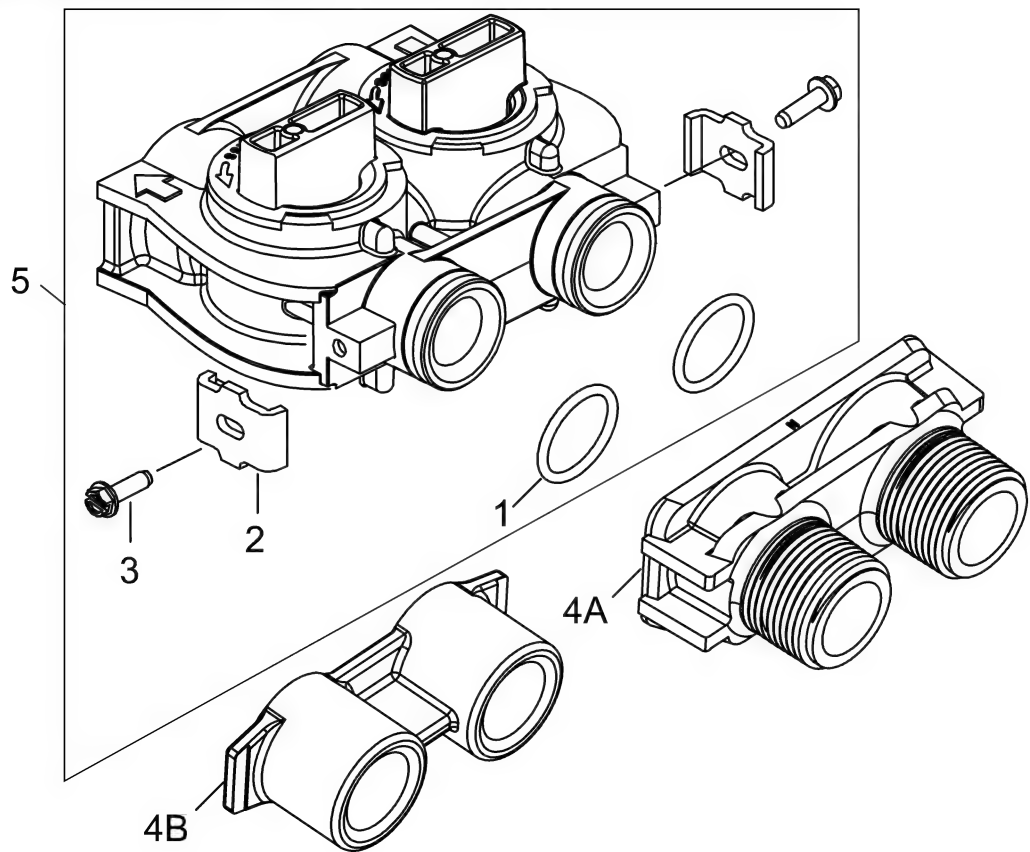
BYPASS VALVE ASSEMBLY (METAL)



| Item No. | QTY | Part No. | Description |
|----------|--------|---------------------|--|
| 1.....1 | ..... | 40614..... | Bypass Body, 3/4" |
| | | 40634..... | Bypass Body, 1", SS |
| 2.....1 | ..... | 14105..... | Seal, Bypass, 560CD |
| 3.....1 | ..... | 11972..... | Plug, Bypass |
| 4.....1 | ..... | 11978..... | Side Cover |
| 5.....1 | ..... | 13604-01..... | Label |
| 6.....8 | ..... | 15727..... | Screw, 10-24 x 0.5" |
| 7.....1 | ..... | 11986..... | Side Cover |
| 8.....1 | ..... | 11979..... | Lever, Bypass |
| 9.....1 | ..... | 11989..... | Screw, Hex Head, 1/4-14 x 1.5" |
| 10.....1 | ..... | 60040SS..... | Bypass Valve, 5600, 3/4" NPT Blk Grip Lever, SS |
| | | 60041SS..... | Bypass Valve, 5600, 1" NPT Blk Grip Lever, SS |
| * |2 | 19228-01..... | Adapter Assy, Coupling, w/O-rings |

*Not Shown

BYPASS VALVE ASSEMBLY (PLASTIC)



60049 Rev G

| Item No. | QTY | Part No. | Description |
|----------|--------|---------------------|---|
| 1.....2 | ..... | 13305..... | O-ring, -119 |
| 2.....2 | ..... | 13255..... | Clip, Mounting |
| 3.....2 | ..... | 13314..... | Screw, Slot Ind Hex, 8-18 x .60 |
| 4A.....1 | ..... | 18706..... | Yoke, 1", NPT, Plastic |
| | | 18706-02..... | Yoke, 3/4", NPT, Plastic |
| 4B.....1 | ..... | 13708-40..... | Yoke, 1", Sweat |
| | | 13708-45..... | Yoke, 3/4", Sweat |
| | | 19275..... | Yoke, Angle 90 Deg, 3/4", NPT |
| | | 19275-45..... | Yoke, Angle 90 Deg, 3/4" Sweat |
| | | 19620-01..... | Yoke Assy, 3/4", R/Angle, 90 Deg w/O-rings, Clips & Screws |
| | | 40636..... | Yoke, 1 1/4", NPT |
| | | 40636-49..... | Yoke, 1 1/4", Sweat |
| | | 41027-01..... | Yoke, 3/4", NPT, Cast, Machined |
| | | 41026-01..... | Yoke, 1", NPT, Cast, Machined, SS |
| | | 41026-02..... | Yoke, 1", BSP, Cast, MACHD, SS |
| | | 18706-10..... | Yoke, 1", BSP, Plastic |
| | | 41027-02..... | Yoke, 3/4", BSP, Cast, MACHD |
| | | 18706-12..... | Yoke, 3/4", BSP, Plastic |
| | | 19620-01..... | Yoke Assy, 3/4", R/Angle, 90 Deg |
| 5.....1 | ..... | 60049..... | Bypass Plastic |
| * |2 | 19228-01..... | Adapter Assy, Coupling, w/O-rings |

*Not Shown

GENERAL SERVICE HINTS FOR METER CONTROL

Problem: Softener delivers hard water

Reason: Reserve capacity has been exceeded.

Correction: Check salt dosage requirements and reset program wheel to provide additional reserve.

Reason: Program wheel is not rotating with meter output.

Correction: Pull cable out of meter cover and rotate manually. Program wheel must move without binding and clutch must give positive clicks when program wheel strikes regeneration stop. If it does not, replace timer.

Reason: Meter is not measuring flow.

Correction: Check meter with meter checker.

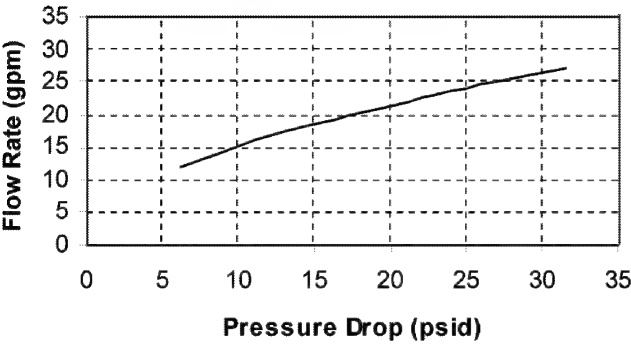
TROUBLESHOOTING

| Problem | Cause | Correction |
|--|--|---|
| Water conditioner fails to regenerate. | Electrical service to unit has been interrupted | Assure permanent electrical service (check fuse, plug, pull chain, or switch) |
| | Timer is defective. | Replace timer. |
| | Power failure. | Reset time of day. |
| Hard water. | By-pass valve is open. | Close by-pass valve. |
| | No salt is in brine tank. | Add salt to brine tank and maintain salt level above water level. |
| | Injector screen plugged. | Clean injector screen. |
| | Insufficient water flowing into brine tank. | Check brine tank fill time and clean brine line flow control if plugged. |
| | Hot water tank hardness. | Repeated flushings of the hot water tank is required. |
| | Leak at distributor tube. | Make sure distributor tube is not cracked. Check O-ring and tube pilot. |
| | Internal valve leak. | Replace seals and spacers and/or piston. |
| Unit used too much salt. | Improper salt setting. | Check salt usage and salt setting. |
| | Excessive water in brine tank. | See "Excessive water in brine tank". |
| Loss of water pressure. | Iron buildup in line to water conditioner. | Clean line to water conditioner. |
| | Iron buildup in water conditioner. | Clean control and add mineral cleaner to mineral bed. Increase frequency of regeneration. |
| | Inlet of control plugged due to foreign material broken loose from pipes by recent work done on plumbing system. | Remove piston and clean control. |
| Loss of mineral through drain line. | Air in water system. | Assure that well system has proper air eliminator control. Check for dry well condition. |
| | Improperly sized drain line flow control. | Check for proper drain rate. |
| Iron in conditioned water. | Fouled mineral bed. | Check backwash, brine draw, and brine tank fill. Increase frequency of regeneration. Increase backwash time. |
| Excessive water in brine tank. | Plugged drain line flow control. | Clean flow control. |
| | Plugged injector system. | Clean injector and screen. |
| | Timer not cycling. | Replace timer. |
| | Foreign material in brine valve. | Replace brine valve seat and clean valve. |
| | Foreign material in brine line flow control. | Clean brine line flow control. |
| Softener fails to draw brine. | Drain line flow control is plugged. | Clean drain line flow control. |
| | Injector is plugged. | Clean injector |
| | Injector screen plugged. | Clean screen. |
| | Line pressure is too low. | Increase line pressure to 20 psi |
| | Internal control leak | Change seals, spacers, and piston assembly. |
| | Service adapter did not cycle. | Check drive motor and switches. |
| Control cycles continuously. | Misadjusted, broken, or shorted switch. | Determine if switch or timer is faulty and replace it, or replace complete power head. |
| Drain flows continuously. | Valve is not programming correctly. | Check timer program and positioning of control. Replace power head assembly if not positioning properly. |
| | Foreign material in control. | Remove power head assembly and inspect bore. Remove foreign material and check control in various regeneration positions. |
| | Internal control leak. | Replace seals and piston assembly. |

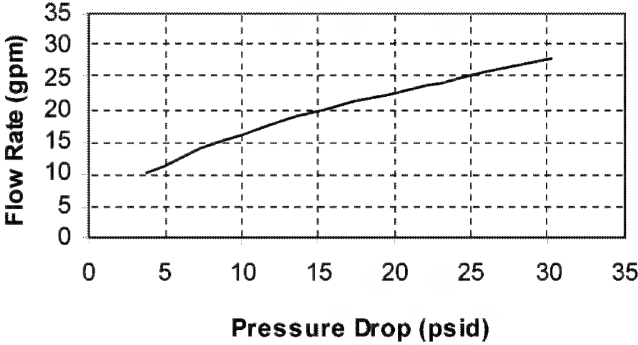
9000/9100/9500 METER FLOW DATA

9000 Meter Flow Data

3/4" Mechanical Meter



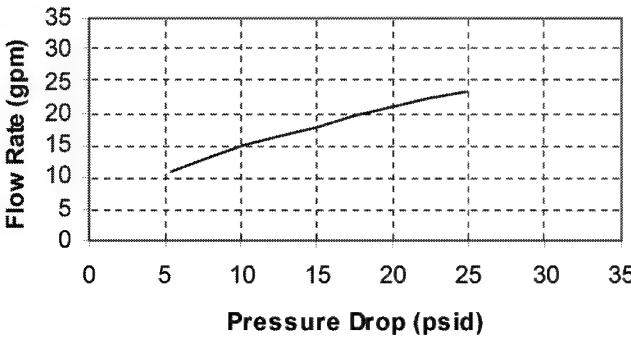
1" Brass Meter



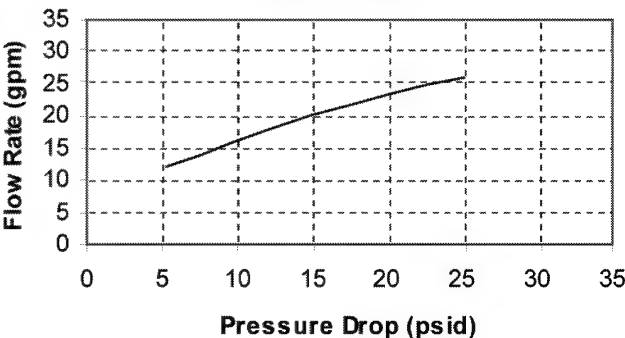
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41092

9100 Meter Flow Data

3/4" Mechanical Meter



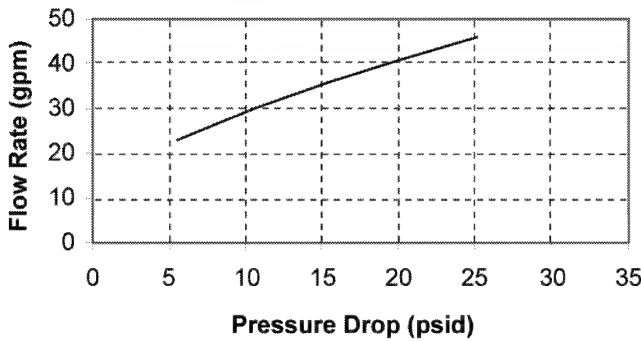
1" Brass Meter



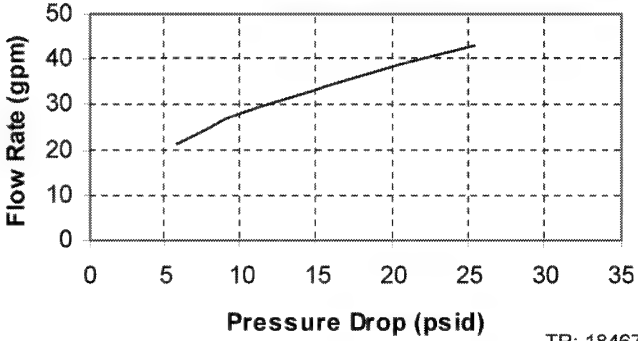
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9500 Meter Flow Data

1 1/2" Meter

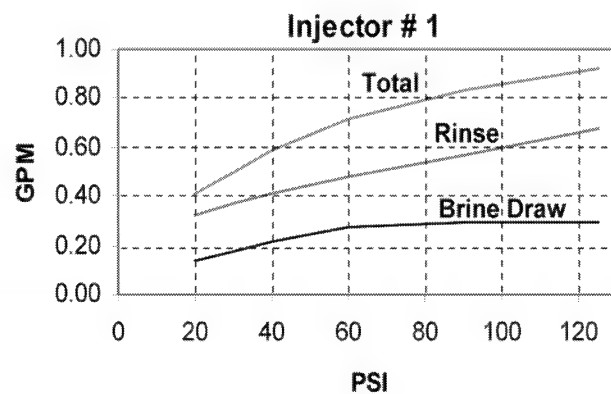
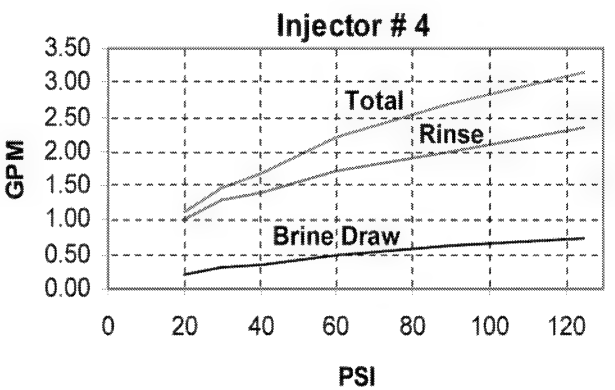
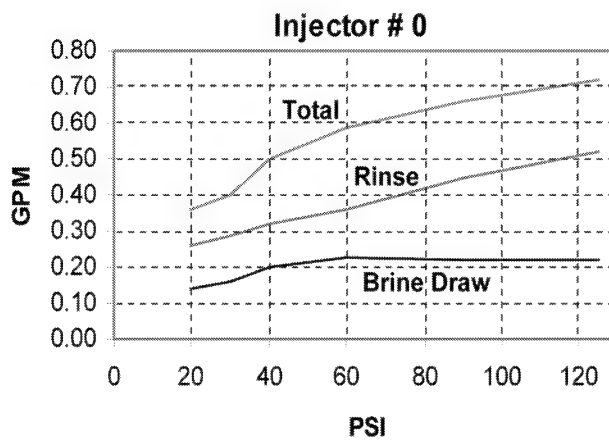
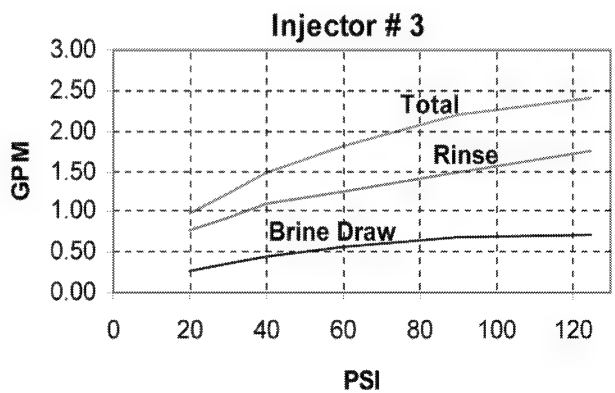
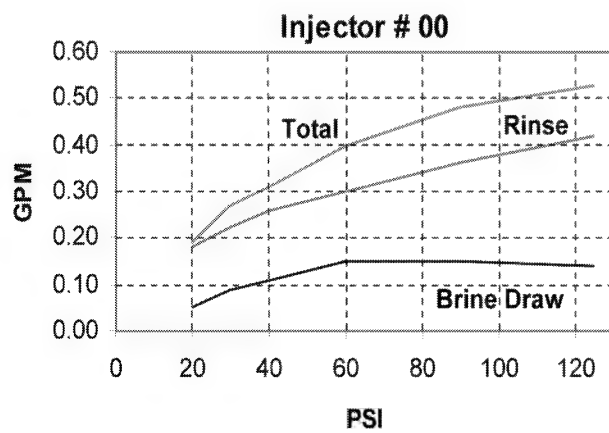
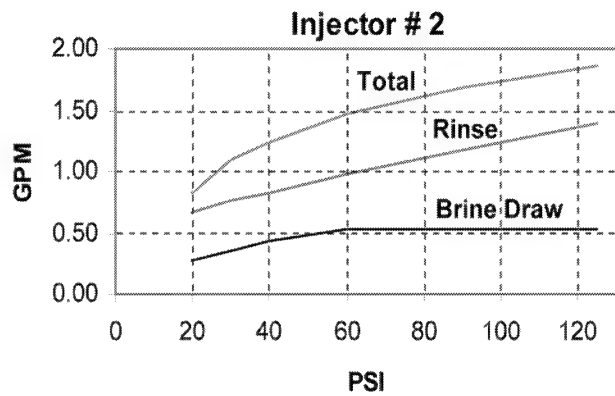
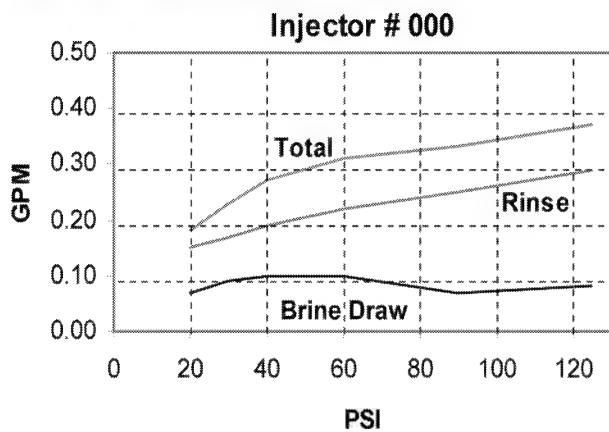


1 1/2" Meter Sleeved



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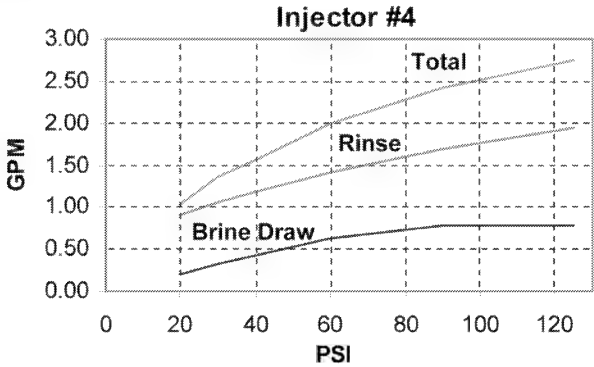
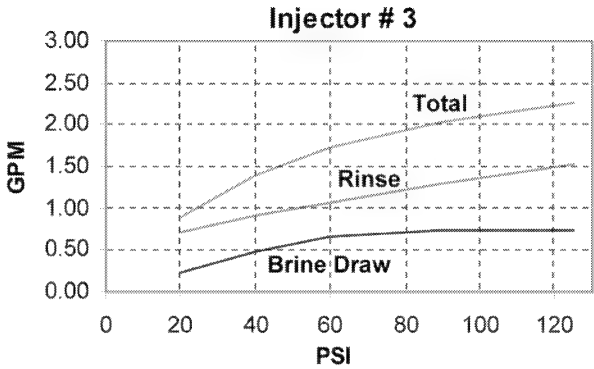
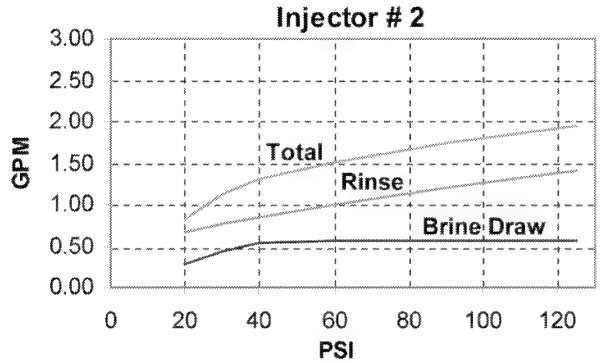
9000/9100/9500 INJECTOR FLOW DATA (1600 SERIES INJECTORS)



TR: 18467
 41092

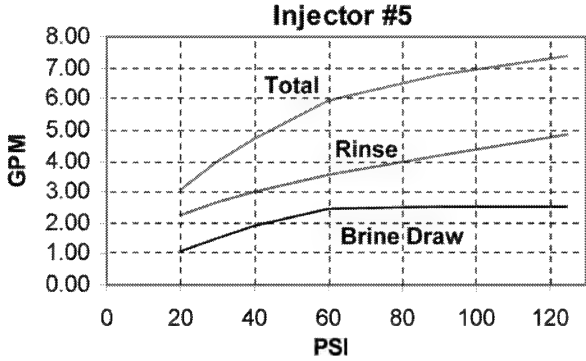
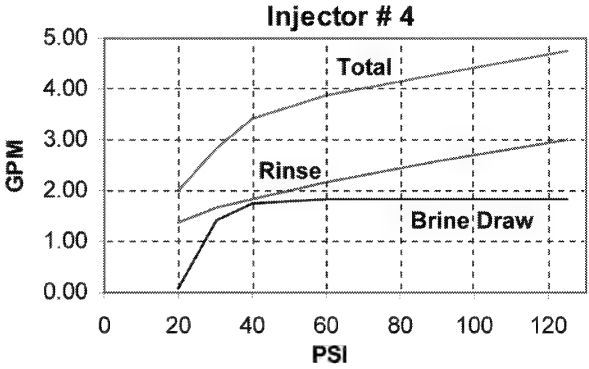
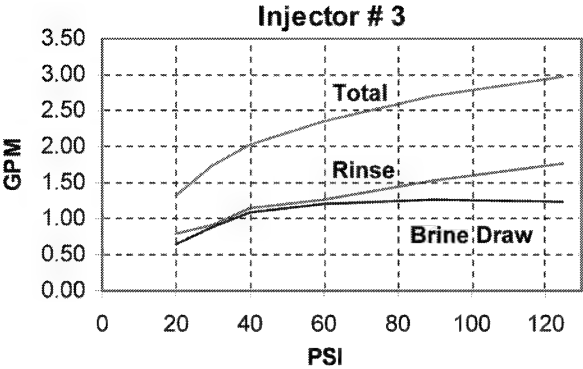
9500 INJECTOR FLOW DATA (1600 &1700 SERIES INJECTORS)

1600 Series Injectors



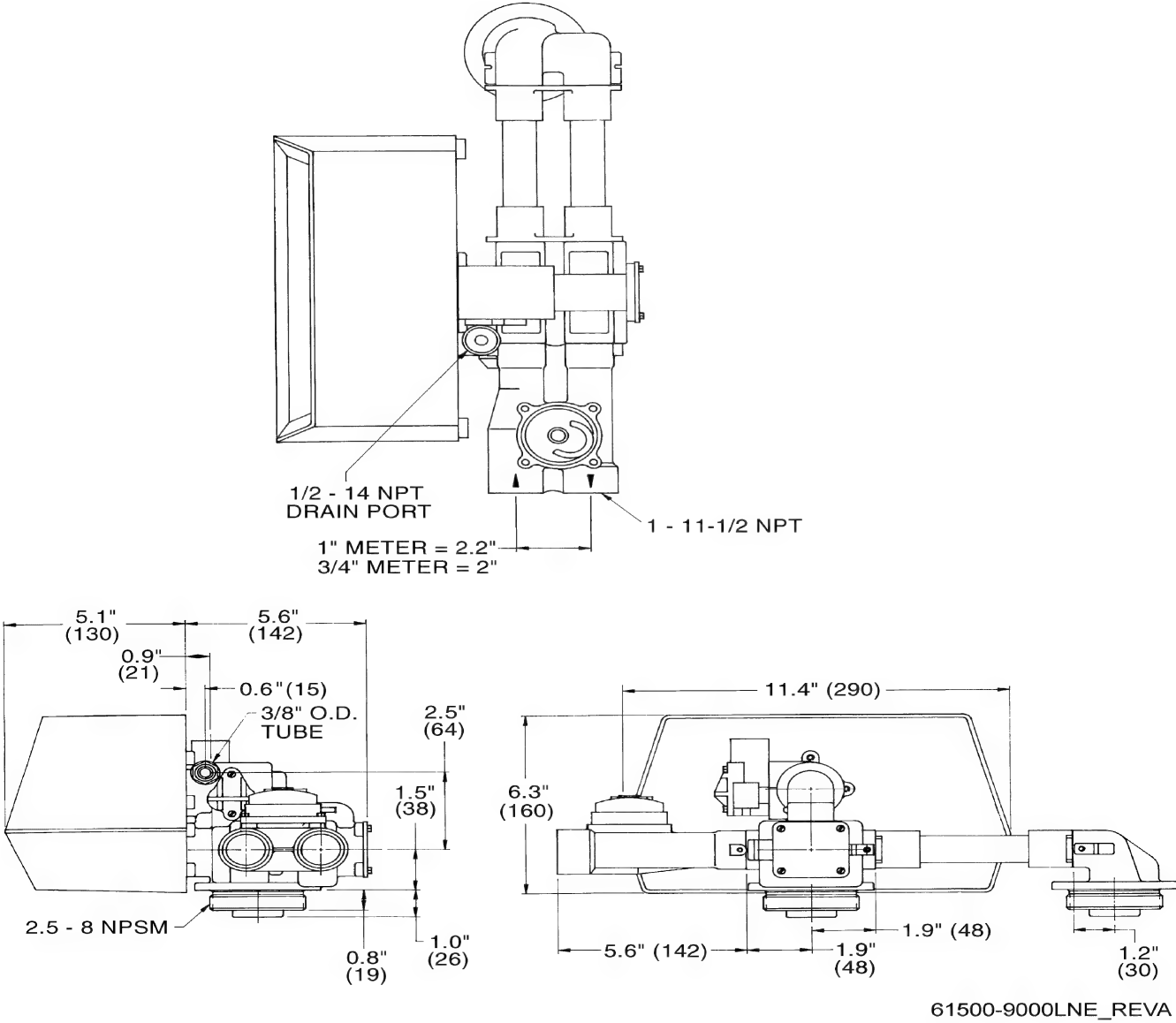
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1700 Series Injectors

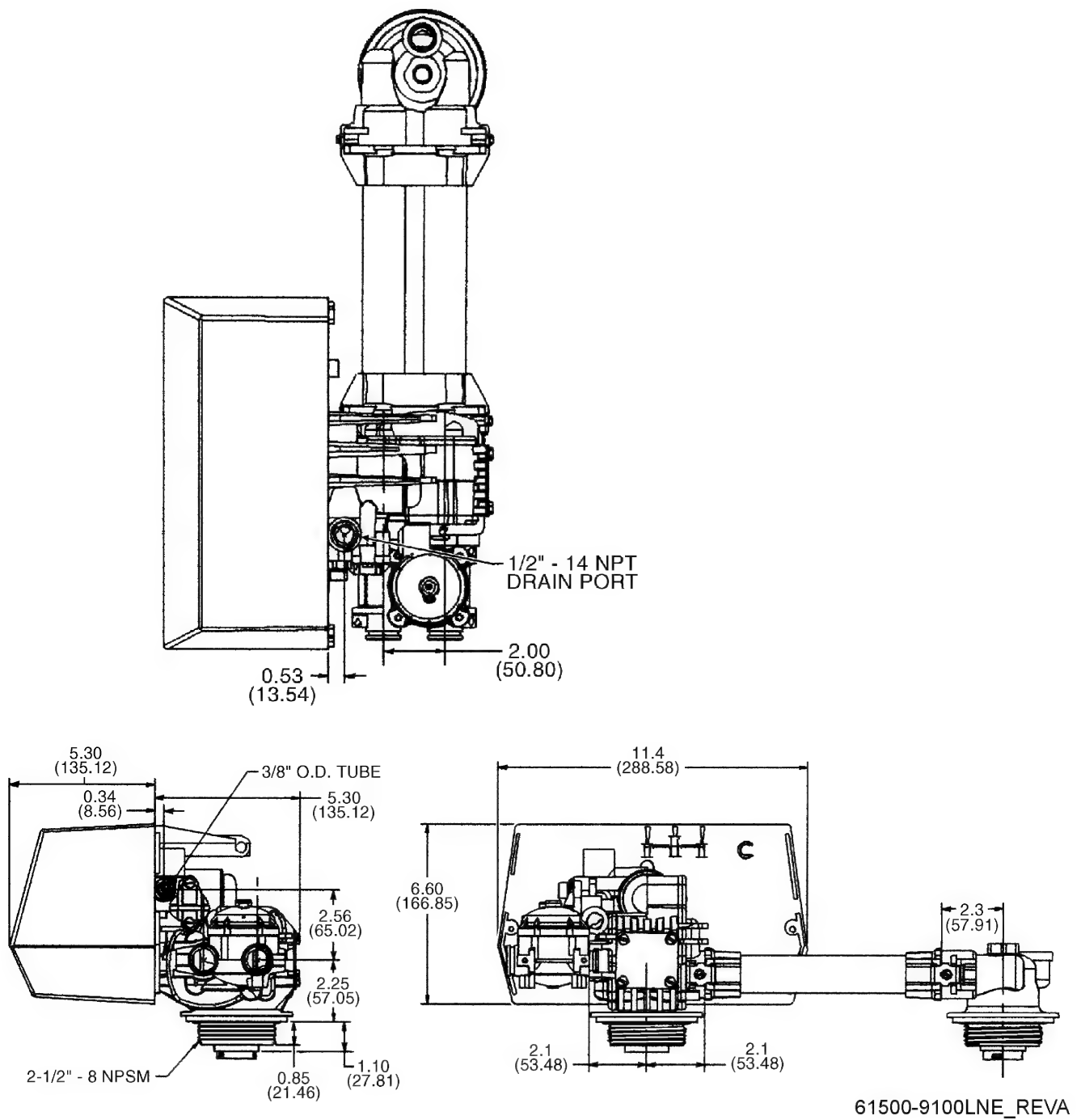


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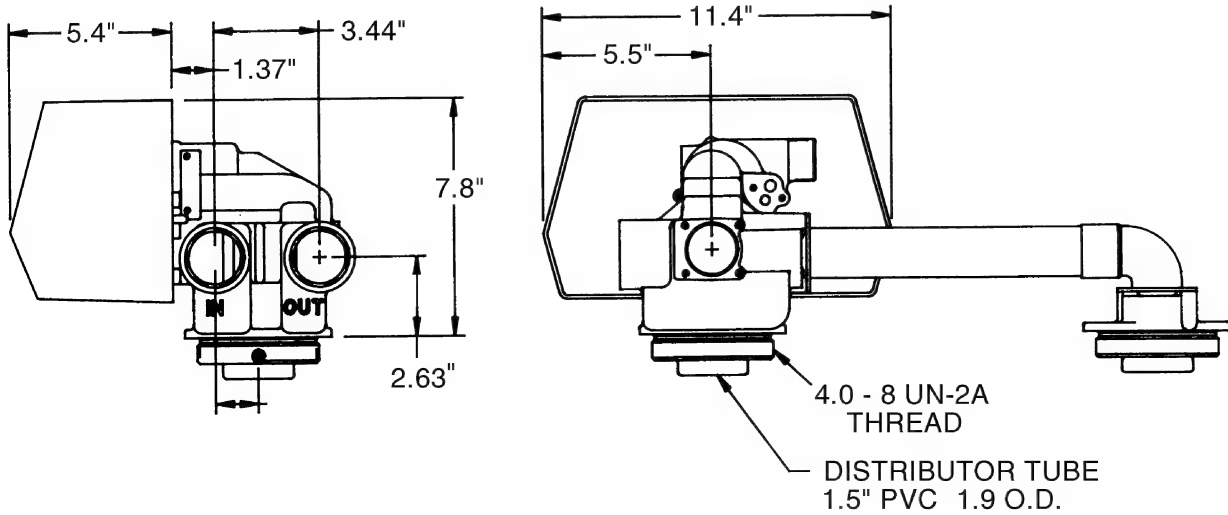
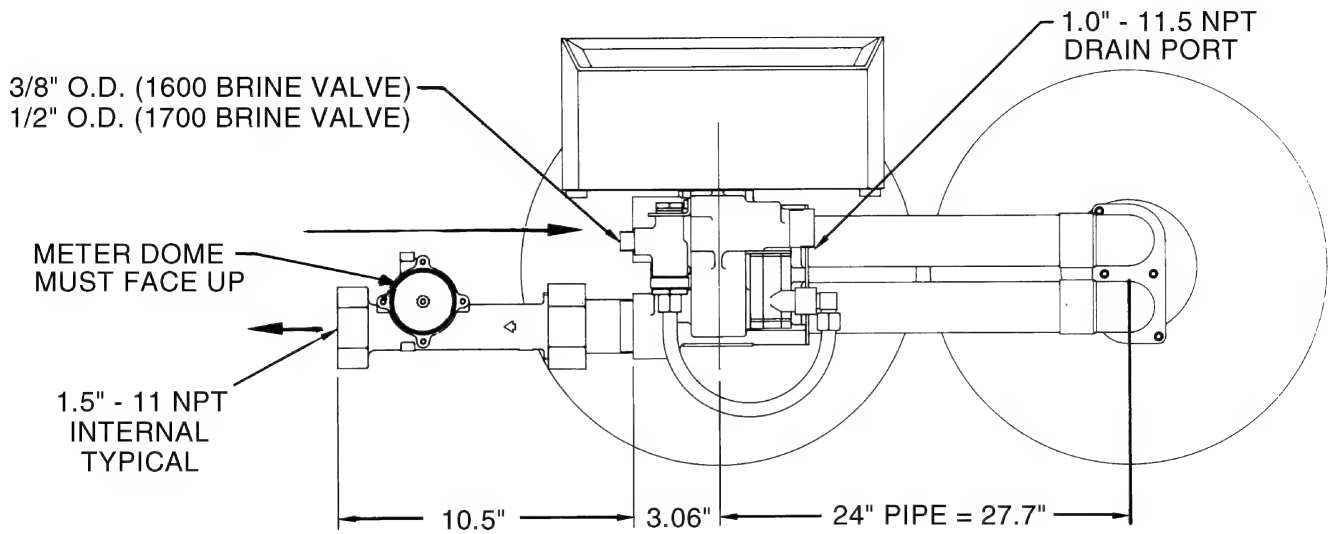
9000 CONTROL DIMENSIONS



9100 CONTROL DIMENSIONS



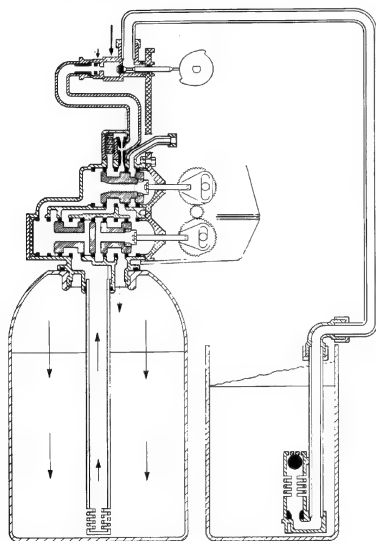
9500 CONTROL DIMENSIONS



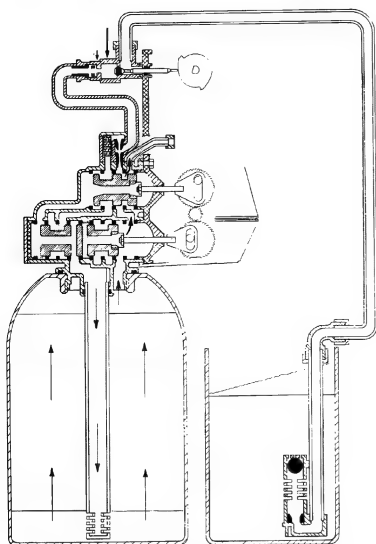
61500-9500LNE_REVA

WATER CONDITIONER FLOW DIAGRAMS

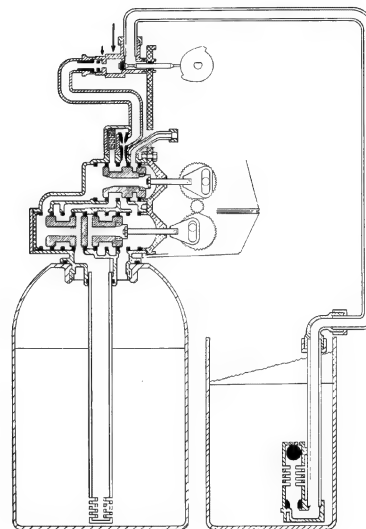
1 In Service Position



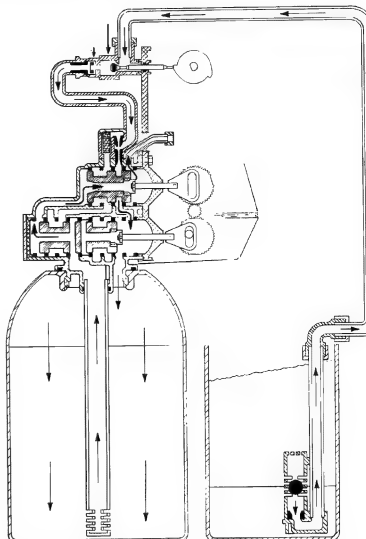
2 Backwash Position



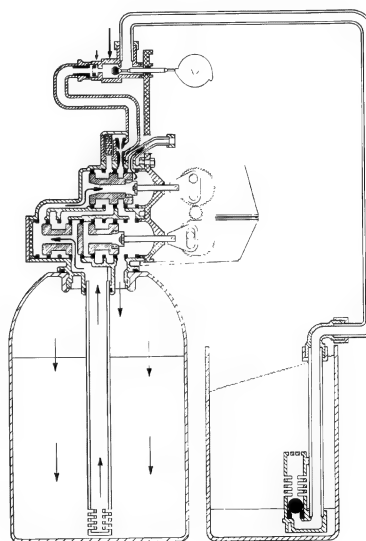
**3 Tanks Switching Position
 (Meter Initiated Regeneration)**



4 Brine Draw Position

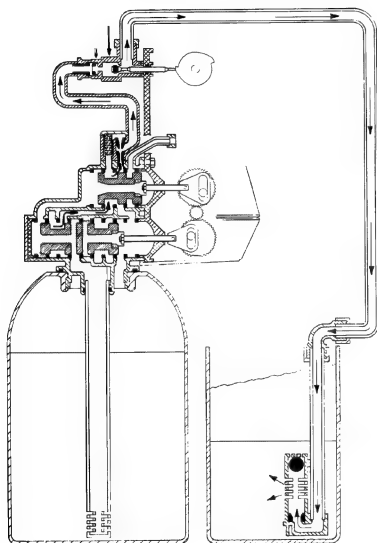


5 Slow Rinse

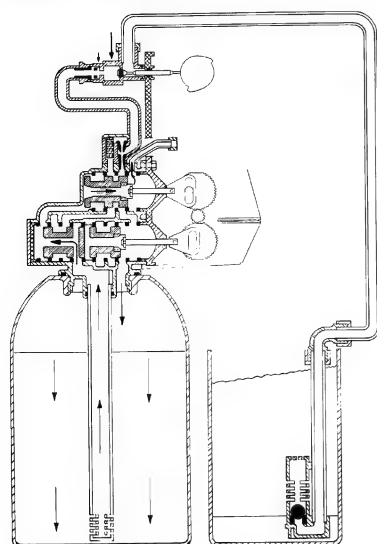


WATER CONDITIONER FLOW DIAGRAMS *continued*

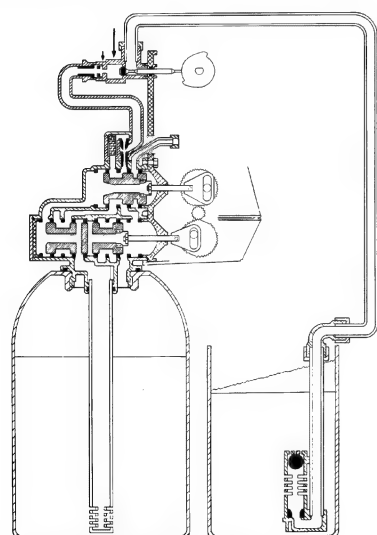
6 Brine Tank Fill Position



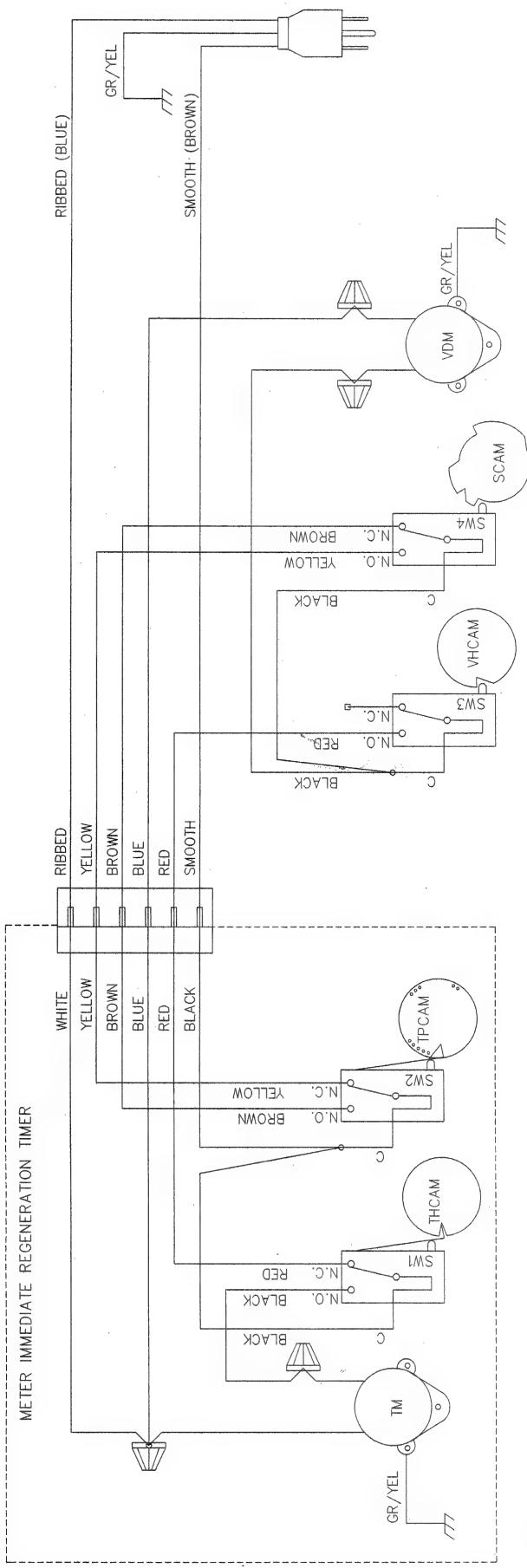
7 Rapid Rinse Position



8 In Service Position, Tanks Switched



9000/9500 WIRING DIGRAM



- TM - TIMER MOTOR
- VDM - VALVE DRIVE MOTOR
- SW1 - TIMER HOMING SWITCH
- SW2 - TIMER PROGRAM SWITCH
- SW3 - VALVE HOMING SWITCH
- SW4 - VALVE PROGRAM SWITCH
- THCAM - TIMER HOMING CAM
- TPCAM - TIMER PROGRAM CAM
- HCAM - VALVE HOMING CAM
- SCAM - VALVE STEP CAM

NOTE:
 1. TWIN TANK METER IMMEDIATE ALTERN REGENERATION.
 2. VALVE SHOWN IN SERVICE POSITION.

19752 Rev B

SERVICE ASSEMBLIES

Brine Line Flow Controls (9000/9100):

60022-12BLFC, .125 GPM, 5000/5600/9000/9100
 60022-25BLFC, .25 GPM, 5000/5600/9000/9100
 60022-50BLFC, .50 GPM, 5000/5600/9000/9100
 60022-100BLFC, 1.0 GPM, 5000/5600/9000/9100
 60350.....Brine Valve Assy, 9000/9100

Brine Line Flow Controls (9500):

60020-25BLFC, .25 GPM, 1600
 60020-50BLFC, .50 GPM, 1600
 60020-100BLFC, 1.0 GPM, 1600

Brine Valve Assemblies:

60037-610Brine Valve, 9500/1600, .25 GPM,
 Cold & HW 180°
 60037-620Brine Valve, 9500/1600, .50 GPM,
 Cold & HW 180°
 60037-630Brine Valve, 9500/1600, 1.0 GPM,
 Cold & HW 180°
 60350.....Brine Valve Assy 9000/9100,
 Cold & HW 180°
 60350-01Brine Valve Assy, 9000/9100/Twinfl100,
 Cold & HW 180°

1700 Brine Valve Assemblies (9500):

60039-XX.....Brine Valve, 1700/9500, Cold &
 HW 180°

Bypass Assemblies:

60040SS.....Bypass Valve, 5600, 3/4" NPT
 60041SS.....Bypass Valve, 5600, 1" NPT
 60049.....Bypass Plastic Assy

Injector Assemblies (9000/9100):

60385-X.....Injector Assembly (specify size of
 injector)

| Injector | Number | DLFC | Number | BLFC | Number |
|-----------|---------|-------|---------|-------|---------|
| Red #0 |00 | Blank | ... 0 | Blank | ... 0 |
| White #1 | ...01 | 1.2 | 1 | 0.25 | 1 |
| Blue #2 | ...02 | 1.5 | 2 | 0.50 | 2 |
| Yellow #3 | ...03 | 2.0 | 3 | 1.00 | 3 |
| Green #4 | ...04 | 2.4 | 4 | | |
| | | 3.0 | 5 | | |
| | | 3.5 | 6 | | |
| | | 4.0 | 7 | | |
| | | 5.0 | 8 | | |
| | | 7.0 | 9 | | |

Injector Assemblies (9500):

60381-03Injector Assy, 1700, #3, Cold & HW 150°
 60381-04Injector Assy, 1700, #4, Cold & HW 150°
 60381-05Injector Assy, 1700, #5, Cold & HW 150°
 60381-06Injector Assy, 1700, #6, Cold & HW 150°
 60480-01Injector Assy, 1600, #1, Plastic,
 Cold Water
 60480-02Injector Assy, 1600, #2, Plastic,
 Cold Water
 60480-03Injector Assy, 1600, #3, Plastic,
 Cold Water
 60480-04Injector Assy, 1600, #4, Plastic,
 Cold Water
 60481-21Injector Assy, 1600, #1, SS, HW 180°
 60481-21Injector Assy, 1600, #2, SS, HW 180°
 60481-21Injector Assy, 1600, #3, SS, HW 180°
 60481-21Injector Assy, 1600, #4, SS, HW 180°

Meter Assemblies (9000/9100):

15078-01Adapter, 1" Coupling
 60086.....Meter Assy, 5600/9000/9100,
 3/4" Std/Range
 60087.....Meter Assy, 5600/9000/9100, 3/4", Ext
 60389.....Meter Assy, 9000/9100, 1"
 60389NP.....Meter Assy, 9000/9100, 1", N/P
 60389-20Meter Assy, 9000/9100, 1", BSP/Metric
 60390.....Meter Assy, 9000/9100, 1", Ext
 60390NP.....Meter Assy, 9000/9100, 1", Ext, N/P
 60390-20Meter Assy, 9000/9100, 1",
 Ext/BSP/Metric
 60612.....Meter Assy, 9000/9100, 1", Std Range,
 HW 150°
 60612NP.....Meter Assy, 9000/9100, 1", Std Range,
 HW 150°, NP
 14038.....Meter Cap Assy
 15150.....Meter Cap Assy, Ext
 15218.....Meter Cap Assy
 15218NP.....Meter Cap Assy, Std, NP
 15237.....Meter Cap Assy, Ext
 15237NP.....Meter Cap Assy, Ext, NP
 13509.....Impeller, Meter
 13509-01Impeller, Celcon, HW 150°

SERVICE ASSEMBLIES *continued*

Meter Assemblies (9500):

| | |
|------------------|---|
| 60610-01 | Meter, 2850/9500, 1 1/2" Std |
| 60610-01HW | Meter, 2850/9500, 1 1/2" Std, HW 150° |
| 60610-01NP | Meter, 2850/9500, 1 - 1/2" Std, N/P |
| 60610-02 | Meter, 2850/9500, 1 - 1/2" Ext |
| 60610-02HW | Meter, 2850/9500, 1 1/2" Ext, HW 150° |
| 60610-02NP | Meter, 2850/9500, 1 - 1/2" Ext, N/P |
| 60610-21 | Meter, 2850/9500, 1 - 1/2" Std/BSP Metric |
| 60610-21NP | Meter, 2850/9500, 1 - 1/2" Std/BSP Metric, Nickel Plated |
| 60610-22 | Meter, 2850/9500, 1 - 1/2" Ext/BSP Metric |
| 60610-22NP | Meter, 2850/9500, 1 - 1/2" Ext/BSP Metric/Nickel Plated |
| 60611-01HW | Meter, 2850/9500, 1" Sleeve, 1 1/2" Std, HW 150° |
| 60611-01 | Meter, 2850/9500, 1" Sleeve, 1 1/2" Std Meter |
| 60611-01NP | Meter, 2850/9500, 1" Sleeve, NP 1 1/2" Std Meter |
| 60611-02 | Meter, 2850/9500, 1" Sleeve, 1 1/2" Ext Meter |
| 60611-02NP | Meter, 2850/9500, 1" Sleeve, NP 1 1/2" Ext Meter |
| 17790 | Sleeve, Meter, 1 1/2" x 1" (NOTE: when reducing a 1-1/2" meter to a 1" meter, the program wheel and timer settings must be changed to a 1" meter size) |

Meter Checker Kits:

| | |
|-------------|------------------------|
| 60460 | Meter Checker Kit, Std |
| 60461 | Meter Checket Kit, Ext |

Piston Assemblies:

| | |
|----------------|---|
| 60108 | Piston Assy, 9500, Upper |
| 60108-01 | Piston Assy, 9500, Upper, HW 180° |
| 60109 | Piston Assy, 9500, Lower |
| 60109-01 | Piston Assy, 9500, Lower HW, 180° |
| 60400 | Piston Assy, 9000/9100, Top |
| 60400-01 | Piston Assy, 9000/9100, HW Upper, 180° |
| 60401 | Piston Assy, 9000/9100, Lower |
| 60401-01 | Piston Assy, 9000/9100 Lower, HW 180° |

Seal & Spacer Kits:

| | |
|----------------|---|
| 60125 | Seal & Spacer Kit, 5600/9000 Top |
| 60125-20 | Seal & Spacer Kit, Top, 559 PE Cold and Chloramine |
| 60125HW | Seal & Spacer Kit, 9000/9100, Upper HW 180° |
| 60133-01 | Seal & Spacer Kit, 9500, Lower, Cold & HW 180° |
| 60133-20 | Seal & Spacer Kit, 9500, Lower |
| 60133-30 | Seal & Spacer Kit, 9500, Lower |
| 60134 | Seal & Spacer Kit, 9500, Upper, Cold & HW 180° |
| 60134-20 | Seal & Spacer Kit, 9500, Upper |
| 60134-30 | Seal & Spacer Kit, 9500, Upper |
| 60421 | Seal & Spacer Kit, 9000/9100, Bottom |
| 60421-20 | Seal & Spacer Kit, 9000/9100, Bottom 559PE |
| 60421HW | Seal & Spacer Kit, 9000/9100, Bottom, HW 180° |

Second Tank Assemblies (9000):

| | |
|------------------|--|
| 14202-01 | Screw, Hex Washer Mach, 8-32 x 5/16 18-8 S.S. |
| 13255 | Clip, Mounting |
| 15078-01 | Adapter Assy, 1" Coupling |
| 14864-01 | Adapter, 9000/9100, 2nd Tank, Machd w/O-rings |
| 14864-01NP | Adapter, 9000/9100, 2nd Tank, Machd, NP |
| 15823-06 | Yoke Assy, 6" Tank & 6" Tube |
| 15823-06NP | Yoke Assy, 6" Tank, NP 6" Tubes |
| 15823-12 | Yoke Assy, 6" - 12" Tank, 8 1/2 Tube |
| 15823-12NP | Yoke Assy, 6" - 12" Tank, NP 8 1/2" Tubes |
| 15823-14 | Yoke Assy, 14" Tank, 10 1/2" Tube |
| 15823-14NP | Yoke Assy, 14" Tank, NP 10 1/2" Tube |
| 15823-16 | Yoke Assy, 16" Tank, 12 1/2" Tube |
| 15823-16NP | Yoke Assy, 16" Tank, NP 12 1/2" Tube |

Second Tank Assemblies (9100):

| | |
|----------------|--------------------------------|
| 60425-12 | Tube Assy, 9100, 6-12" Tanks |
| 60425-16 | Tube Assy, 9100, 13-16" Tanks |
| 14865 | Adapter Assy, 2nd Tank, 9100 |
| 61419 | Kit, 1.05" Distributor Adapter |

Second Tank Assemblies (9500):

| | |
|------------------|---|
| 16919-01 | Valve Body, 9500 Machd |
| 16919-01NP | Valve Body, 9500 Machd, NP |
| 16919-21 | Valve Body, 9500 BSP, Mtrc, Machd |
| 16919-21NP | Valve Body, 9500 BSP, Mtrc, Machd Nickel Plated |
| 60715-16 | Tube Assy, 9500, 2nd Tank for 14" to 16" Tanks |
| 60715-16NP | Tube Assy, 9500, 2nd Tank, NP for 14" to 16" Tanks |
| 60715-20 | Tube Assy, 9500, 2nd Tank for 20" Tanks |
| 60715-24 | Tube Assy, 9500, 2nd Tank for 20" and 24" Tanks |
| 60715-24NP | Tube Assy, 9500, 2nd Tank, Nickel for 20-24" Tanks |

Single Piece Plastic End Cap Assemblies

| | |
|----------------|------------------------------|
| 61701-01 | Plug Assy, End Cap 9000/9100 |
| 61701-02 | Plug Assy, End Cap 9500 |

Tools:

| | |
|-------------|------------------------------|
| 12763 | Stuffer Tool Assy, 5600/9000 |
| 13061 | Puller Assy, Port Ring |
| 13759 | Tool, DLFC Retainer |

Valve Body Assembly (9100):

| | |
|-------------|-----------------------|
| 40688 | Valve Body Assy, 9100 |
| 18303 | O-ring, -336 |
| 18569 | Retainer, Tank Seal |

Model XT

Advanced Electronic Controller



The XT advanced electronic controller is available for single control valve operation. The XT can be configured to the Fleck® 2510, 2750, 2850, 2850s, 2900, 3150, 3900, 9000, 9100 and 9500 valves.

In Time Clock Delay mode, the XT will display the number of days until the next scheduled regeneration. Some meter delayed types will display the volume remaining (SRV) minus the reserve. Once the volume remaining is zero, the display will start counting down the reserve volume and queue (RGQ) regeneration.

Features

- Time of day backup for up to 12 hours of power loss
- Calculating Reserves:
 - Daily Variable - adjusts reserve based on previous day's water usage*
 - Day of Week - adjusts reserve for each day of the week based on an average of the last three weeks*
- LED Status Indicator:
 - Blue: In Service*
 - Green: In Regeneration*
 - Red: Error with codes*
- New shift key (left arrow) for digit selecting, allows faster programming
- 2 Line/16 character LCD backlit display
- Defaults for all valve, piston, and cam types are stored
- Diagnostics:
 - Current Flow Rate*
 - Peak Flow Rate (can be reset)*
 - Totalizer (can be reset)*
 - Hours between Last two Regenerations*
 - Hours between Last Regeneration*
 - Volume Remaining (Adjustable)*
 - Precious Days Usage*
 - Reserve Volume*
 - Software Version*
- Uses same mounting hardware and cable harness as the 3200NXT and 3214NXT
- Easy installation with plug-in wiring harnesses

Options

- Programmable auxiliary relay output:
 - Dry contact Relay (fused at 3 amps)
 - Program entire Regeneration
 - Two programmable time windows during regeneration
- Remote Lock
- Programmable for Fleck® or generic meters

System Type

| | |
|--------------------------------|--------------|
| Meter Delayed Weekly Reserve | Single Valve |
| Meter Delayed Variable Reserve | Single Valve |
| Meter Delayed Fixed Reserve | Single Valve |
| Meter Immediate | Single Valve |
| Remote Signal Start Delayed | Single Valve |
| Remote Signal Start Immediate | Single Valve |
| Time Clock Delayed | Single Valve |
| Twin Tank | Single Valve |
| Volume Override Delayed | Single Valve |
| Volume Override Immediate | Single Valve |

Regenerant Flow

Downflow, Upflow Variable Fill, Upflow Brine First, Downflow DB BW, Upflow Backwash, Backwash Filter

Valve Type

2510, 2750, 2850, 2850s, 2900, 3150, 3900, 9000, 9100, & 9500

Generic Meter Guidelines

Meter power supply is +19V DC, up to 10 mA. 01-150 pulses per gallon/liter output. Open collector output, board will sink up to 10mA at 5V DC. Pulse rate generated must not exceed 100 pulses per second (100 Hz) or 6,000 pulses per minute

Electrical Rating

24V Pentair transformers:
 115V AC +/- input, 24V AC output
 230V AC +/- input, 24V AC output

Humidity

95% RH, Non-condensing

Two Programming Levels

User Mode:

Water Hardness
 Regeneration Day Override
 Regeneration Time

Master Programming:

System Type
 Valve Type
 Regenerant Flow
 Display Format
 Unit Capacity
 Capacity Safety Factor
 Water Hardness
 Regeneration Day Override
 Regeneration Time
 Cycle Steps
 Auxiliary Relay Outputs
 Flow Meter Sizes

XT

Service Manual



IMPORTANT: Fill in Pertinent Information on Page 3 for Future Reference

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IMPORTANT PLEASE READ:

- The information, specifications and illustrations in this manual are based on the latest information available at the time of printing. The manufacturer reserves the right to make changes at any time without notice.
- This manual is intended as a guide for service of the valve only. System installation requires information from a number of suppliers not known at the time of manufacture. This product should be installed by a plumbing professional.
- This unit is designed to be installed on potable water systems only.
- This product must be installed in compliance with all state and municipal plumbing and electrical codes. Permits may be required at the time of installation.
- If daytime operating pressure exceeds 80 psi, nighttime pressures may exceed pressure limits. A pressure reducing valve must be installed.
- Do not install the unit where temperatures may drop below 32°F (0°C) or above 125°F (52°C).
- Do not place the unit in direct sunlight. Black units will absorb radiant heat increasing internal temperatures.
- Do not strike the valve or any of the components.
- Warranty of this product extends to manufacturing defects. Misapplication of this product may result in failure to properly condition water, or damage to product.
- A prefilter should be used on installations in which free solids are present.
- In some applications local municipalities treat water with Chloramines. High Chloramine levels may damage valve components.
- Correct and constant voltage must be supplied to the control valve to maintain proper function.

Job Specification Sheet

NOTE: Some options may not be available depending on valve model or other options chosen.

Circle and/or Fill in the Appropriate Data for Future Reference.

System Type: Meter Immediate / Time Clock Delayed / Twin Tank / Volume Override Delay
 Volume Override Immediate / Remote Signal Start Delayed
 Remote Signal Start Immediate / Meter Delayed Week Reserve
 Meter Delayed Variable Reserve / Meter Delay Fixed Reserve

Valve Type: 2510/2850 2750 2900 3150 3900 9000/9100/9500 Proprietary A B E

Regenerant Flow: Down Flow / UF Variable Fill / UF Brine First
 Downflow DB BW / UF Backwash / Back Wash Filter

Initial Tank: Tank 1 or Tank 2

Remote Signal Start: On or Off

Display Format: U.S. or Metric (French Degrees, German Degrees, or PPM)

Unit Capacity: _____ Grains/French Degrees/German Degrees/PPM

Water Hardness: _____ Grains/French Degrees/German Degrees/PPM

Capacity Safety Factor: Zero or _____ %

Volume Override: _____ (Gallons or M³)

Regeneration Day Override: Off or Every _____ Days

Regeneration Time: Delayed _____ AM/PM or _____ Immediate

Regeneration Cycle Step #1: ____ : ____ : ____

Regeneration Cycle Step #2: ____ : ____ : ____

Regeneration Cycle Step #3: ____ : ____ : ____

Regeneration Cycle Step #4: ____ : ____ : ____

Regeneration Cycle Step #5: ____ : ____ : ____

Media Volume: _____ (CuFt or Liter)

Salt Dosage: _____ (lbs/CuFt or grams/Liter)

BLFC Size: _____ gpm

Auxiliary Relay: Enabled or Disabled

Auxiliary Relay Start 1: ____ : ____ : ____

Auxiliary Relay End 1: ____ : ____ : ____

Auxiliary Relay Start 2: ____ : ____ : ____

Auxiliary Relay End 2: ____ : ____ : ____

Chemical Pump: Enabled or Disabled

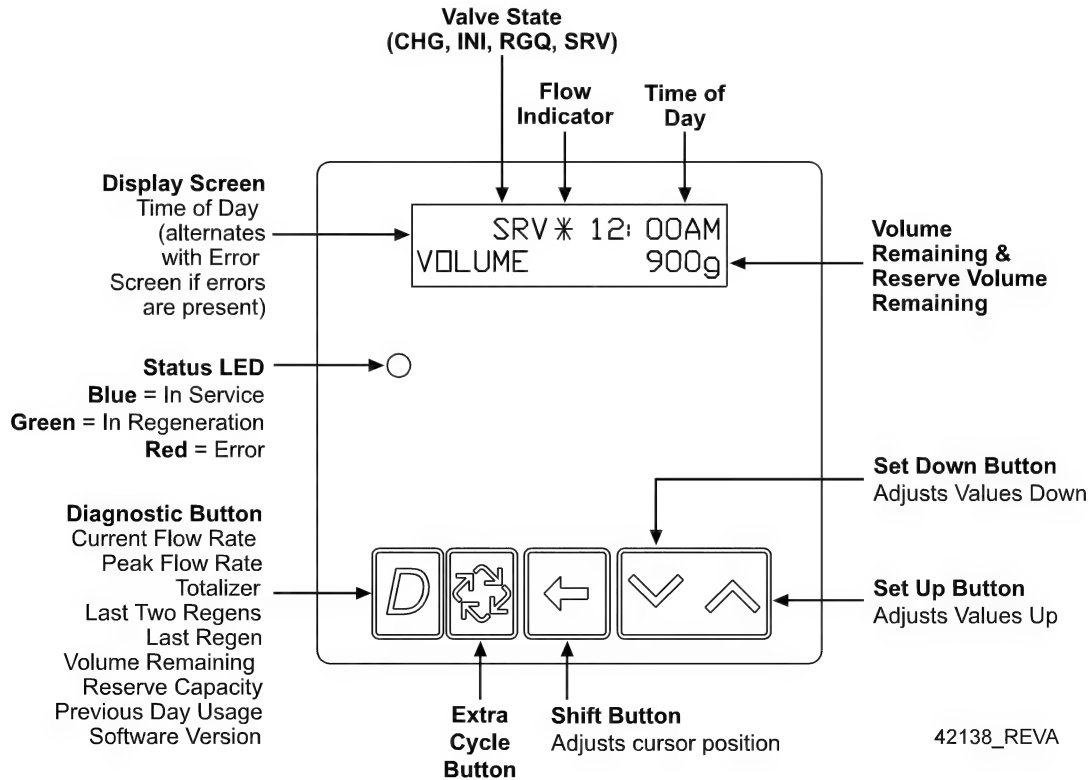
CPO Aux Relay Volume: _____ (Gallons or M³)

CPO Aux Relay: ____ : ____ : ____

Flow Meter Size: Paddle: .75" 1.0" 1.5" 2.0" 3.0"
 Turbine: .75" 1.0" 1.5"

Generic Flow Meter: Maximum Flow Rate: Add __ Gallons every __ Pulses

Timer Operation



Valve State:

CHG (Change of State)

CHG will be displayed when the lower drive changes from one state to another in dual piston valves.

INI (Initializing)

INI will display on the screen for 30 to 45 seconds when initializing after a power failure reset or programming.

RGQ (Regeneration Queued)

RGQ indicates that the reserve has been entered in a delayed system and regeneration has been queued. When in the main screen, press the Shift button to toggle service (SRV) with RGQ.

Service (SRV)

SRV will display when the unit is in service.

LED Status Lights:

Blue LED:

Illuminates while the unit is in service and no errors exist. The unit will always be in service unless a regeneration trigger has occurred (green LED light will be displayed).

Green LED:

Illuminates when the unit is in Regeneration mode, unless an error condition exists.

Red LED:

Illuminates when there is an error.

Flow Indicator:

A rotating line (appearing as a rotating star shape) will display on the screen when flow is going through the meter.

Timer Operation

Regeneration:

- A time initiated control valve regenerates when the number of programmed days has been reached
- A flow initiated control valve regenerates when the volume count is zero or is below reserve capacity

| System Type | Regeneration Trigger |
|--------------------------------|--|
| Time Clock Delayed | A) Day override parameter is reached and B) the time of day matches the regeneration day override time |
| Meter Immediate | Regenerates as soon as the volume remaining has been depleted |
| Meter Delayed Fixed Reserve | A) Volume remaining has been depleted to the fixed reserve volume and B) the regeneration time has been reached |
| Meter Delayed Variable Reserve | A) Volume remaining has been depleted to the variable reserve volume and B) the regeneration time has been reached |
| Meter Delayed Weekly Reserve | A) Volume remaining has been depleted to the weekly variable reserve volume and B) the regeneration time has been reached |
| Remote Signal Start Immediate | Immediately once a valid remote signal is asserted continuously for the programmed period of time |
| Remote Signal Start Delayed | Once a valid remote signal is asserted continuously for the programmed period of time and regeneration time has been reached |
| Volume Override Immediate | As soon as the programmed volume remaining has been depleted from the tank |
| Volume Override Delayed | As soon as the programmed volume remaining has been depleted from the tank and the regeneration time has been reached |
| Twin Tank | Regenerates immediately once volume remaining has been depleted |

Timer Operation

Setting the Time of Day

1. Press and hold the Up or Down button for 2 seconds.
2. Press the Shift button to select the digit you want to modify.
3. Press the Up or Down buttons to adjust the value.
4. Press the Extra Cycle button to return to the normal display screen, or after a 5 second timeout.

NOTE: The “D” button (Diagnostic) can be pressed to exit without saving.

Manually Initiating a Regeneration

1. When timer is in service, press the Extra Cycle button for 5 seconds on the main screen.
2. The timer advances to Regeneration Cycle Step #1, and begins programmed time count down.
3. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #2 (if active).
4. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #3 (if active).
5. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #4 (if active).
6. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #5 (if active).
7. Press the Extra Cycle button once more to advance the valve back to in service.

NOTE: A manually initiated or queued regeneration can be cleared by pressing the Extra Cycle button for less than 5 seconds. A system queued regeneration can only be cleared by stepping through a manual regeneration. If regeneration occurs for any reason prior to the delayed regeneration time, the manual regeneration request shall be cleared. Pressing the Extra Cycle button while in regeneration will cause the upper drive to advance to the next step immediately.

Queued Regeneration (RGQ)

From the display screen, while the unit is in service, hold down the Extra Cycle button until “RGQ” displays. The valve will regenerate when the set regeneration time has been reached.

Timer Operation During Regeneration

In the main display screen, the timer shows the current regeneration cycle and the time for that step. The **green LED light** will display when the unit is in regeneration. Once all regeneration steps are complete, the timer returns to in service, displays a **blue LED light**, and resumes normal operation.

Timer Operation During Programming

The timer enters program mode (unit must be in service). While in the program mode the timer continues to operate normally, monitoring water usage. Timer programming is stored in memory permanently upon a normal exit from programming mode.

Timer Operation During A Power Failure

All program settings are stored in permanent memory. Current valve position, cycle step time elapsed, and time of day are stored during a power failure, and will be restored upon power re-application. Time is kept during a power failure, and time of day is adjusted upon power up (as long as power is restored within 12 hours).

NOTE: The time of day on the main display screen will flash for 5 minutes when there has been a power outage. The flashing of the time of day can be stopped by pressing any button on the display.

Regeneration Day Override Feature

If the Day Override option is turned on and the valve reaches the set Regeneration Day Override value, the Regeneration Cycle starts at the programmed regeneration time.

Timer Operation

Flow Meter Equipped Timer

As treated water is used, the Volume Remaining display counts down from the calculated system capacity, less the reserve volume. Once capacity reaches zero or reserve, if the immediate system the unit will regenerate immediately. If it is a Fixed, Variable, or Weekly reserve, the unit will queue a regeneration (RGQ) and count down Reserve Volume until the set regeneration time.

NOTE: Reserve Volume is only available in a RGQ system.

Volume Remaining (Less Reserve)

| | |
|--------|---------|
| SRV * | 08:45AM |
| VOLUME | 1000G |

Reserve Volume

| | |
|--------|---------|
| RGQ * | 09:32AM |
| VOLUME | 100G |

Master Programming Mode Flow Chart

NOTE: Depending on current option settings, some displays cannot be viewed or set.



To Set Time of Day:

Press and hold the Up or Down buttons for 2 seconds. Press the Shift button to select the digit you want to modify.

Entering Master Programming Mode:

1. Press and hold the Shift and Up buttons for 5 seconds.
OR
2. Set the Time of Day display to **12:01 P.M. or 12:01HR**. Then go to the main display screen, press the Up and Down buttons at the same time for 5 seconds.



| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | Y | S | T | E | M | T | Y | P | E | : | | | | | | | |
| T | I | M | E | | | C | L | K | | D | E | L | A | I | Y | E | D |

Options: Time Clock Delayed [TIME CLK DELAYED] (Default)
 Meter Immediate [METER IMMEDIATE]
 Meter Delayed Fixed Reserve [MTR DLY FIX RSV]
 Meter Delayed Variable Reserve [MTR DLY VAR RSV]
 Meter Delayed Week Reserve [MTR DLY WEEK RSV]
 Remote Signal Start Immediate [RSS IMMEDIATE]
 Remote Signal Start Delayed [RSS DELAYED]
 Volume Override Immediate [VOL OVERRIDE IMM]
 Volume Override Delayed [VOL OVERRIDE DLY]
 Twin Tank [TWIN TANK]



| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|--|---|---|---|---|---|---|---|---|---|--|--|--|
| V | A | L | V | E | | T | Y | P | E | : | | | | | | | |
| | | | | | | 2 | 5 | 1 | 0 | / | 2 | 8 | 5 | 0 | | | |

Options: 2510/2850 [2510/2850] (Default)
 2750 [2750]
 2900 [2900]
 3150 [3150]
 3900 [3900]
 9000/9100/9500 [9000/9100/9500]
 Proprietary A [PROPRIETARY A]
 Proprietary B [PROPRIETARY B]
 Proprietary E [PROPRIETARY E]



| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|---|--|--|
| R | E | G | E | N | E | R | A | N | T | | F | L | O | W | : | | |
| D | O | W | N | | F | L | O | W | | | | | | | | | |

Options: Down Flow [DOWN FLOW] (Default)
 Back Wash Filter [BACK WASH FILTER]
 Up Flow [UP FLOW]
 Up Flow Variable Fill [UF VARIABLE FILL]



NOTE: Only shown when System Type is Twin Tank

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|--|---|---|---|---|---|---|--|--|--|--|
| I | N | I | T | I | A | L | | T | A | N | K | : | | | | | |
| | | | | | | | | T | A | N | K | | 1 | | | | |

Options: Tank 1 [TANK 1] (Default)
 Tank 2 [TANK 2]



NOTE: Only shown when System Type is Remote Signal Start

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|--|---|---|---|---|---|---|---|---|--|--|--|
| R | E | M | O | T | E | | S | I | G | N | A | L | | | | | |
| S | T | A | R | T | : | | | 0 | : | 0 | 1 | : | 0 | 0 | | | |

Options: Remote Signal Start [0:01:00] (Default)
Range: 1 second to 10 hours



| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|
| D | I | S | P | L | A | Y | | F | O | R | M | A | T | | | | |
| | | | | | | U | S | - | G | A | L | L | O | N | S | | |

Options: Grains per Gallon [US-GALLONS] (Default)
 French Degrees [METRIC - M3, F°TH]
 German Degrees [METRIC - M3, G°TH]
 Parts per Million [METRIC - M3, PPM]



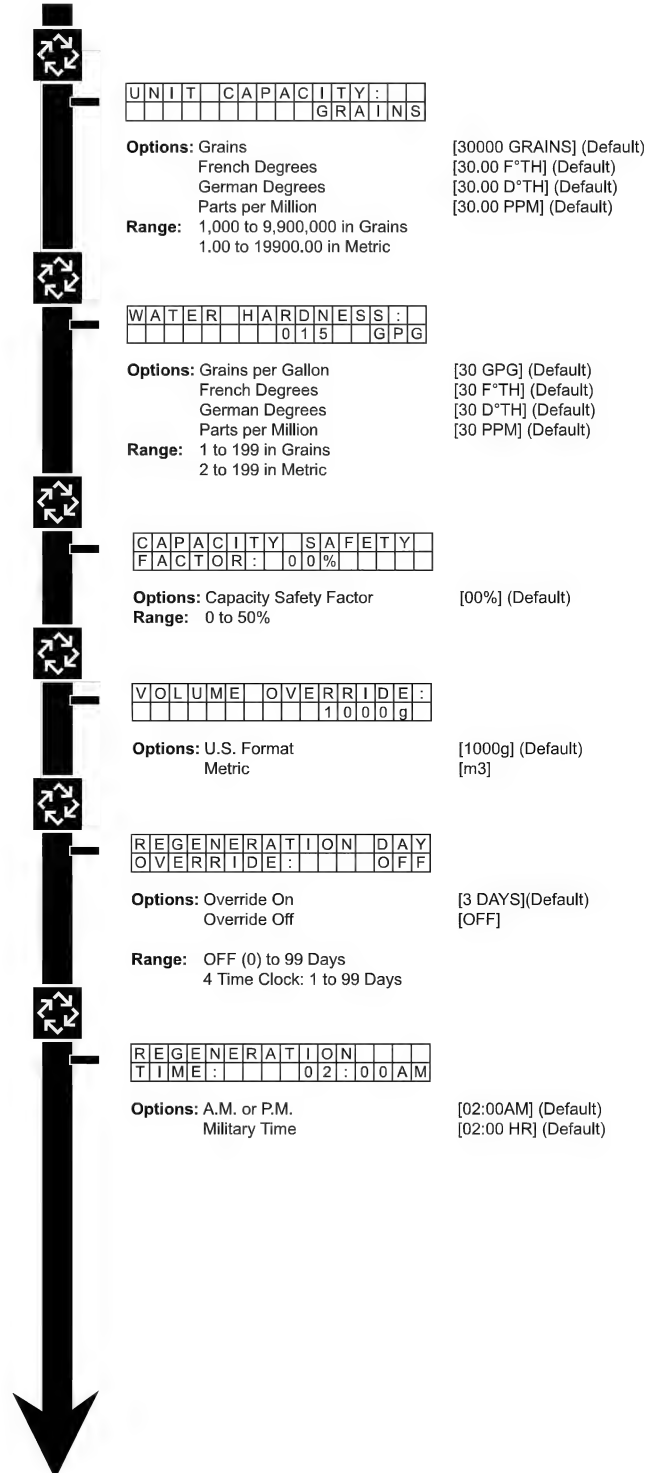
CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode Flow Chart

NOTE: Depending on current option settings, some displays cannot be viewed or set.

NOTE: Only shown when System Type is Meter Delayed Fixed Reserve or Volume Override Delayed

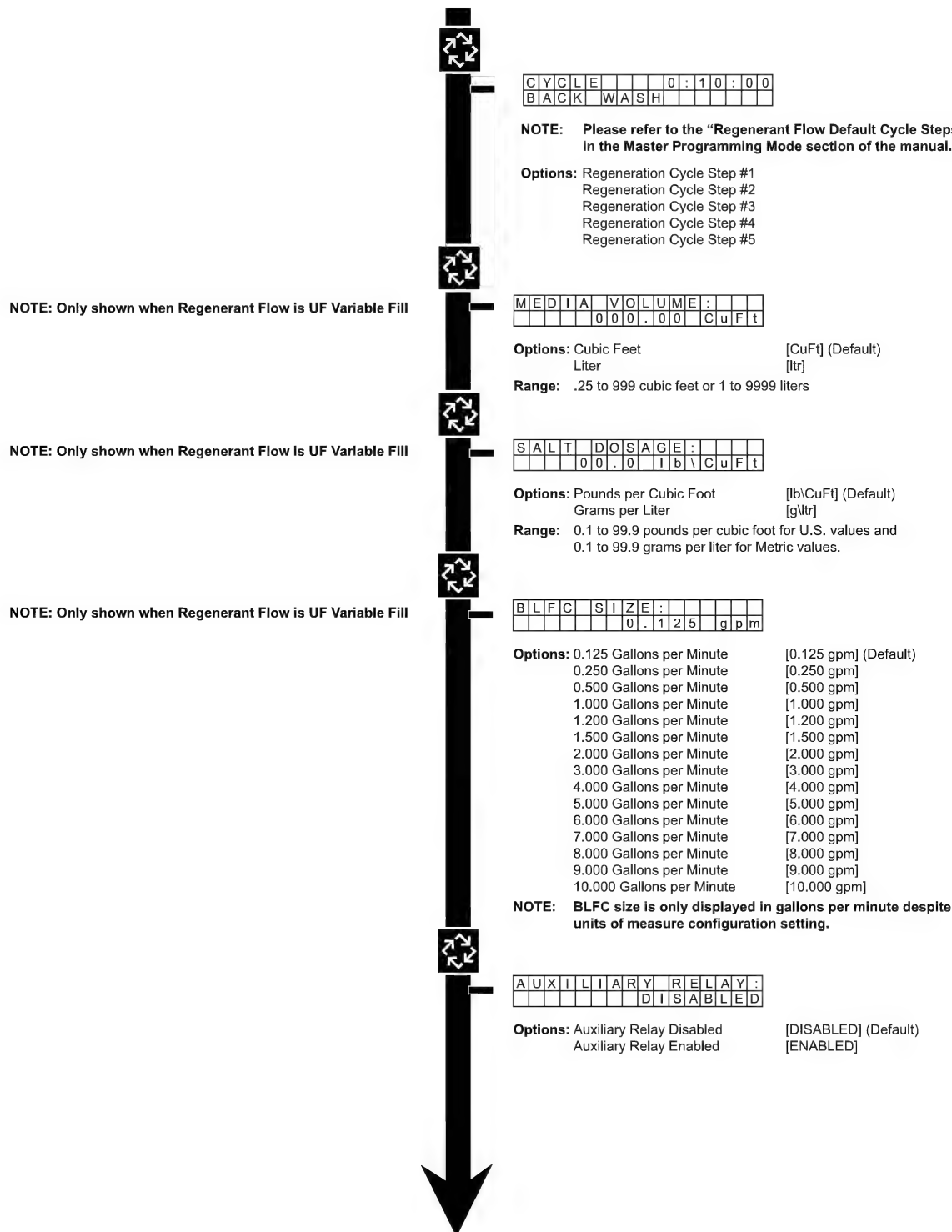
NOTE: Only shown when System Type is Volume Override Immediate or Volume Override Delayed



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode Flow Chart

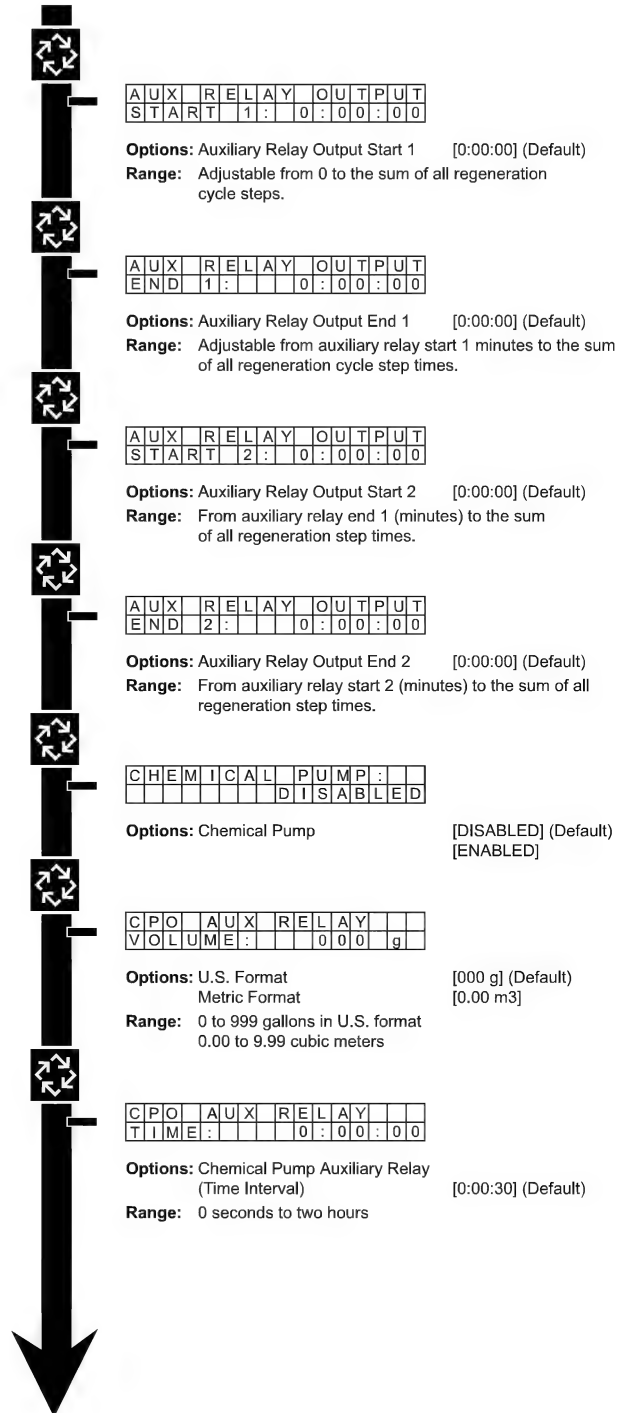
NOTE: Depending on current option settings, some displays cannot be viewed or set.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode Flow Chart

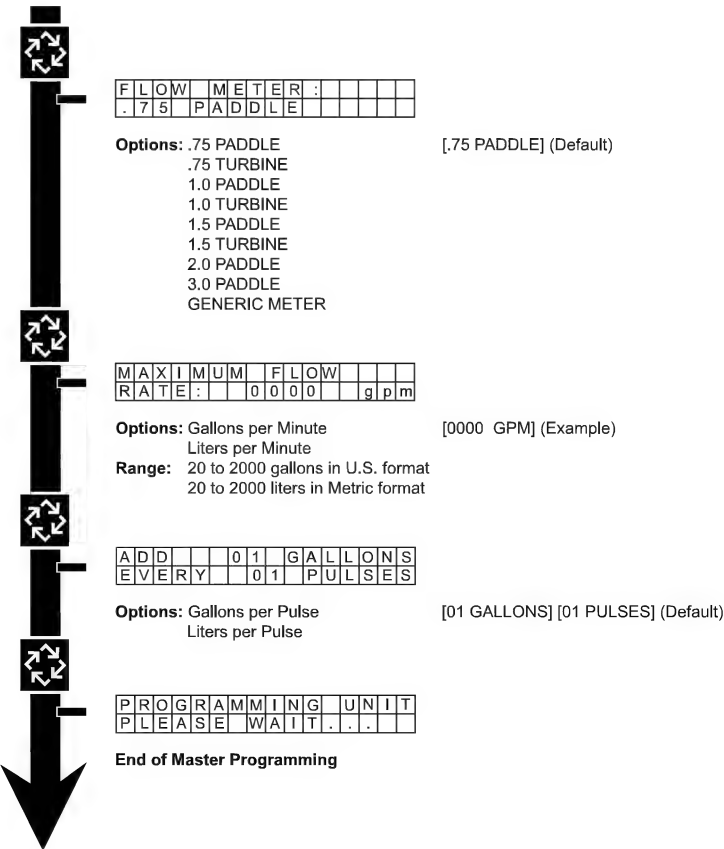
NOTE: Depending on current option settings, some displays cannot be viewed or set.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode Flow Chart

NOTE: Depending on current option settings, some displays cannot be viewed or set.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

When the Master Programming Mode is entered, parameters can be set to make the timer function as needed.

NOTE: Depending on current option settings, some displays cannot be viewed or set.

Entering Master Programming Mode:

1. Press and hold the Shift and Up buttons for 5 seconds.
OR
2. Set the time of day display to **12:01 PM** or **12:01HR** (See the User Programming section to learn how to do this). Then go to the main display screen, press the Up and Down buttons at the same time for 5 seconds.

Exiting Master Programming Mode:

1. Press the Extra Cycle button once per display until all are viewed. Master Programming Mode is exited and the normal display screen appears.
2. To exit the Master Programming Mode without saving, press the Diagnostic button.

NOTE: If no keypad activity is made for 5 minutes while in the Master Programming Mode, or if there is a power failure, no changes will be made, and the unit will go back to the main display screen.

Resets:

Soft Reset: Press and hold the Up and Down buttons for 25 seconds until 12:00PM (or 12:00HR) appears. This resets all parameters except for the flow meter totalizer volume.

Master Reset: Hold the Shift button while powering up the unit. This resets all of the parameters in the unit. Check and verify the choices selected in Master Programming Mode.

1. System Type

This program step selects the system type.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
SYSTEM TYPE:  4
TIME CLK DELAYED
```

2. Valve Type

This program step selects the valve type.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
VALUE TYPE:
2510/2850
```

3. Regenerant Flow

This program step selects how the regenerant flows through the tank (must match cam). The selections available will vary depending on the previously chosen valve model.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
REGENERANT FLOW:
DOWN FLOW
```

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

4. Display Format

This program step selects the display format.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

DISPLAY FORMAT:
 US - GALLONS

5. Unit Capacity

This program step selects the timer's total capacity of hardness that can be removed.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

UNIT CAPACITY:
 0030000 GRAINS

6. Feed Water (Hardness)

This program step is used to set the feed water hardness. The system will automatically calculate volume remaining based on the unit capacity, capacity safety factor (reserve systems only), and feed water hardness entered.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

WATER HARDNESS:
 030 GPG

7. Capacity Safety Factor

This program step is used to set the reserve capacity of the unit. This is a percentage by which the unit's capacity is reduced.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

CAPACITY SAFETY
 FACTOR: 00%

8. Volume Override

This program step is used to set the volume override of the unit.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

9. Regeneration Day Override

This program step sets the maximum amount of time (in days) the unit can be in service without a regeneration.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
REGENERATION DAY
OVERRIDE:01 DAYS
```

10. Regeneration Time

This program step sets the time of day for the regeneration to occur in delayed systems.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
REGENERATION
TIME: 02:00AM
```

11. Regeneration Cycle Step Programming

This program step programs the Regeneration Cycle step times 1 through 5. Please refer to the chart below for regenerant flow default cycle steps and times.

```
CYCLE 1 00:10:00
BACK WASH
```

| Regenerant Flow | Cycle 1 | Time | Cycle 2 | Time | Cycle 3 | Time | Cycle 4 | Time | Cycle 5 | Time |
|------------------|--------------------|------------|--------------------|------------|----------------------|------------|-----------------|------------|-------------|------------|
| Down Flow | Back Wash | 10 Minutes | Brine & Slow Rinse | 1 Hour | Rapid Rinse | 10 Minutes | Brine Tank Fill | 12 Minutes | N/A | N/A |
| Back Wash Filter | Back Wash | 15 Minutes | Draw | 0 | Settling Rinse | 10 Minutes | Refill | 0 | N/A | N/A |
| UF Variable Fill | Brine & Slow Rinse | 10 Minutes | Pause & Delay | 1 Hour | Variable Rapid Rinse | N/A | Brine Tank Fill | 12 Minutes | Rapid Rinse | 10 Minutes |
| Upflow | Brine & Slow Rinse | 1 Hour | Back Wash | 10 Minutes | Rapid Rinse | 10 Minutes | Brine Tank Fill | 12 Minutes | N/A | N/A |

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

12. Media Volume

This program step sets the volume of the media in the resin tank.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

MEDIA VOLUME:
 000.00 CuFt

13. Salt Dosage

This program step sets the salt dosage in the unit.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

SALT DOSAGE:
 00.0 lb/CuFt

14. Brine Line Flow Control Size

This program step allows the selection of the desired brine line flow control size in the unit (must match physical brine line flow control).

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

BLFC SIZE:
 0.125 GPM

15. Auxiliary Relay Output

The next two displays are part of a series of settings used to program the optional relay output. The first setting turns the output on/off during regeneration only. The second turns the output on during service only, every time a set volume of water used has accumulated.

NOTE: When auxiliary outputs are in the OFF (default) setting, press the Up or Down buttons to set the first setting. Then press the Extra Cycle button to advance to the second setting.

a. Timed Auxiliary Relay Output Window (Start & End Time Setting)

This option setting consists of two displays. The first display sets the turn-on time of the output, referenced to the start of the first regeneration cycle. The second display sets the output turn-off time, referenced again to the start of the first regeneration cycle. An OFF setting cancels this setting. All settings are in minutes and output timing is synchronized with regeneration cycle timing.

Start Time: Any time during regeneration.

End Time: At start time, and anytime during the regeneration cycle.

AUXILIARY RELAY:
 DISABLED

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

b. Chemical Pump Auxiliary Relay Output Window

This option setting consists of two displays. The first display sets the volume of water flow at which the output turns on. The second display sets the on time (in seconds) of the output.

- Activate output after volume set is reached.
- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

CHEMICAL PUMP:
 DISABLED

16. Flow Meter Size

This program step sets the size of the flow meter.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

FLOW METER:
 .75 TURBINE

17. Maximum Flow Rate

This program step sets maximum flow rate of the generic flow meter.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

18. Pulses per Gallon/Liter

This program step sets the pulses per gallon/liter for generic flow meters.

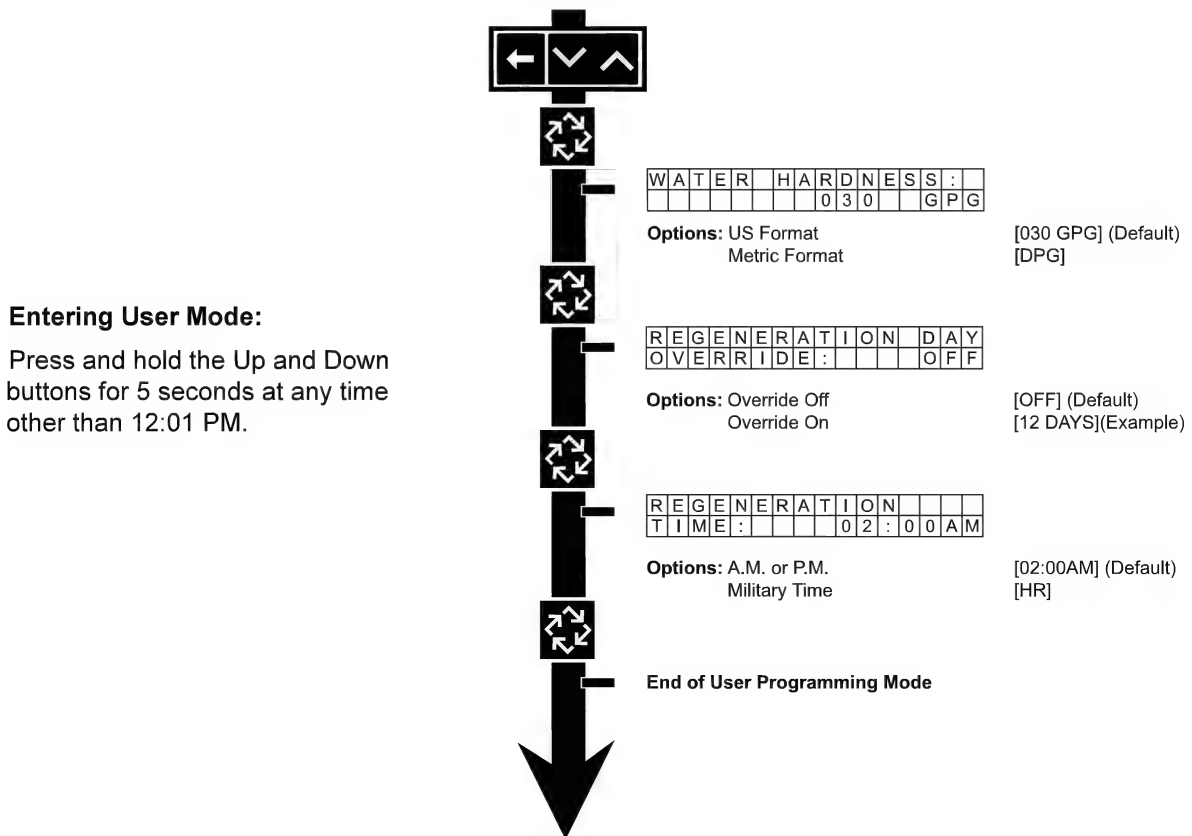
- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

19. End of Master Programming Mode

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

User Programming Flow Chart & Mode

NOTE: Depending on current option settings, some displays cannot be viewed or set.



NOTE: Depending on current option settings, some displays cannot be viewed or set.

1. Enter User Mode

- Press and hold the Up and Down buttons for 5 seconds.

2. Set Feed Water Hardness

- Press the Shift, Up, and Down buttons to move the cursor and change the value of the numbers.
- Press the Extra Cycle button to proceed to the next step.

NOTE: Only displayed when a metered option is chosen under System Type.

3. Set Regeneration Day Override

- To turn on and set the days, press the Down button.
- Press the Shift, Up, and Down buttons to move the cursor and change the value of the numbers.
- Press the Extra Cycle button to proceed to the next step.

4. Regeneration Time

- Press the Shift, Up, and Down buttons to move the cursor and change the value of the numbers.
- Press the Extra Cycle button

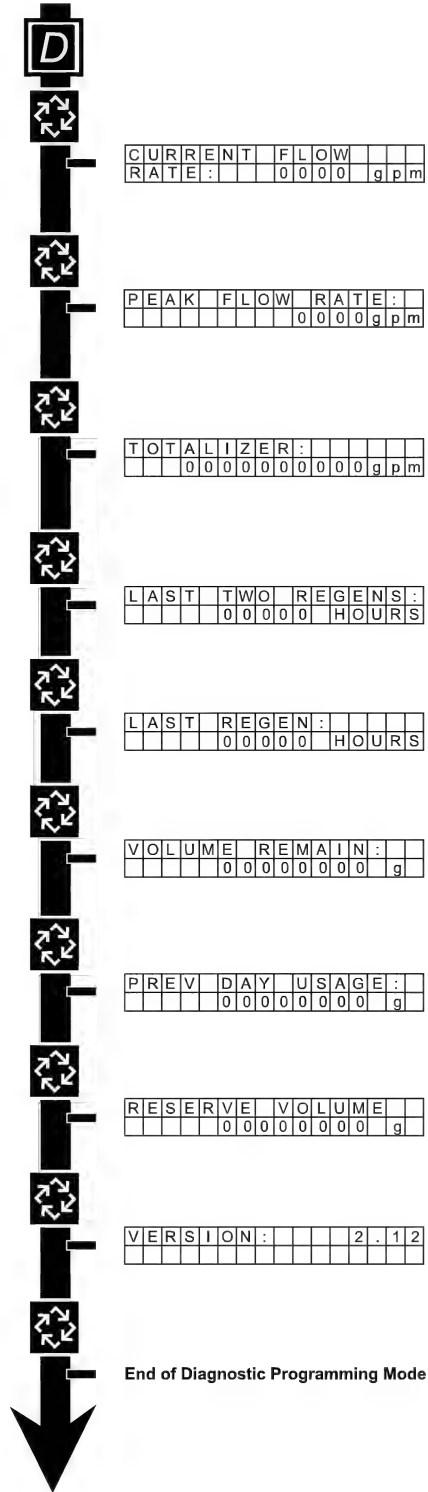
5. End of User Programming Mode

Diagnostic Programming Mode Flow Chart

NOTE: Depending on current option settings, some displays cannot be viewed or set.

Entering Diagnostic Mode:

1. Press and release the "D" button.
2. Press the Extra Cycle button once per display until all displays are viewed and the normal display screen appears.
3. Press and release the "D" button during this mode to exit the Diagnostic Mode.
4. Depending on current option settings, some displays cannot be viewed.



Diagnostic Programming Mode

NOTE: Depending on current option settings, some displays cannot be viewed.

Overview Diagnostic Mode

The current Diagnostic Programming Mode screen will display until either the Extra Cycle button is pressed through for each screen, or the Diagnostic button is pressed. In the event of regeneration occurring while in the Diagnostic Programming Mode, the regeneration step and time remaining will be displayed. When regeneration completes, the display will return to the normal time of day display screen.

Entering and Exiting Diagnostic Mode

Press and release the "D" button to enter the Diagnostic Programming Mode. Pressing the Extra Cycle button will move to the next diagnostic screen. Press the Extra Cycle button once per display until all are viewed. Pressing the Diagnostic button while in Diagnostic Mode will cause the unit to leave the Diagnostic Mode and return to the normal time of day display screen.

1. Current Flow Rate

This program step displays the calculated flow rate for the timer. The below flow rates are the maximum flow rate the timer will read for each meter.

| | | | |
|---------------------|---------------------|----------------------|--------------------|
| .75" Paddle: | 15 gpm (0.06 m3/m) | .75" Turbine: | 15 gpm (0.06 m3/m) |
| 1" Paddle: | 40 gpm (0.15 m3/m) | 1" Turbine: | 90 gpm (0.34 m3/m) |
| 1.5" Paddle: | 180 gpm (0.68 m3/m) | 1.5" Turbine: | 90 gpm (0.34 m3/m) |
| 2" Paddle: | 350 gpm (1.32 m3/m) | | |
| 3" Paddle: | 500 gpm (1.89 m3/m) | | |

— Press the Extra Cycle button.

2. Peak Flow Rate

This program step displays the peak flow rate (1 minute average) since the last regeneration.

— Press the Extra Cycle button.

3. Totalizer

This program step displays the total volume of treated water that passes through the meter.

— Reset to zero by holding the Up and Down buttons for five seconds while in the totalizer screen.

— Press the Extra Cycle button.

4. Hours Between Last Two Regenerations

This program step displays the time between the last two regenerations saved.

— Press the Extra Cycle button.

5. Hours Since Last Regeneration

This program step displays the hours since the last regeneration.

— Press the Extra Cycle button.

6. Volume Remaining

This program step displays the volume remaining. The timer will regenerate if the volume remaining is set to zero. The maximum ranges are the same as the maximum volume calculated on the main screen.

— Press the Extra Cycle button.

7. Previous Day's Water Usage

This program step displays the previous day's water usage.

— Press the Extra Cycle button.

8. Reserve Volume

This program step displays the reserve capacity, ensuring soft water is available at all times.

— Press the Extra Cycle button.

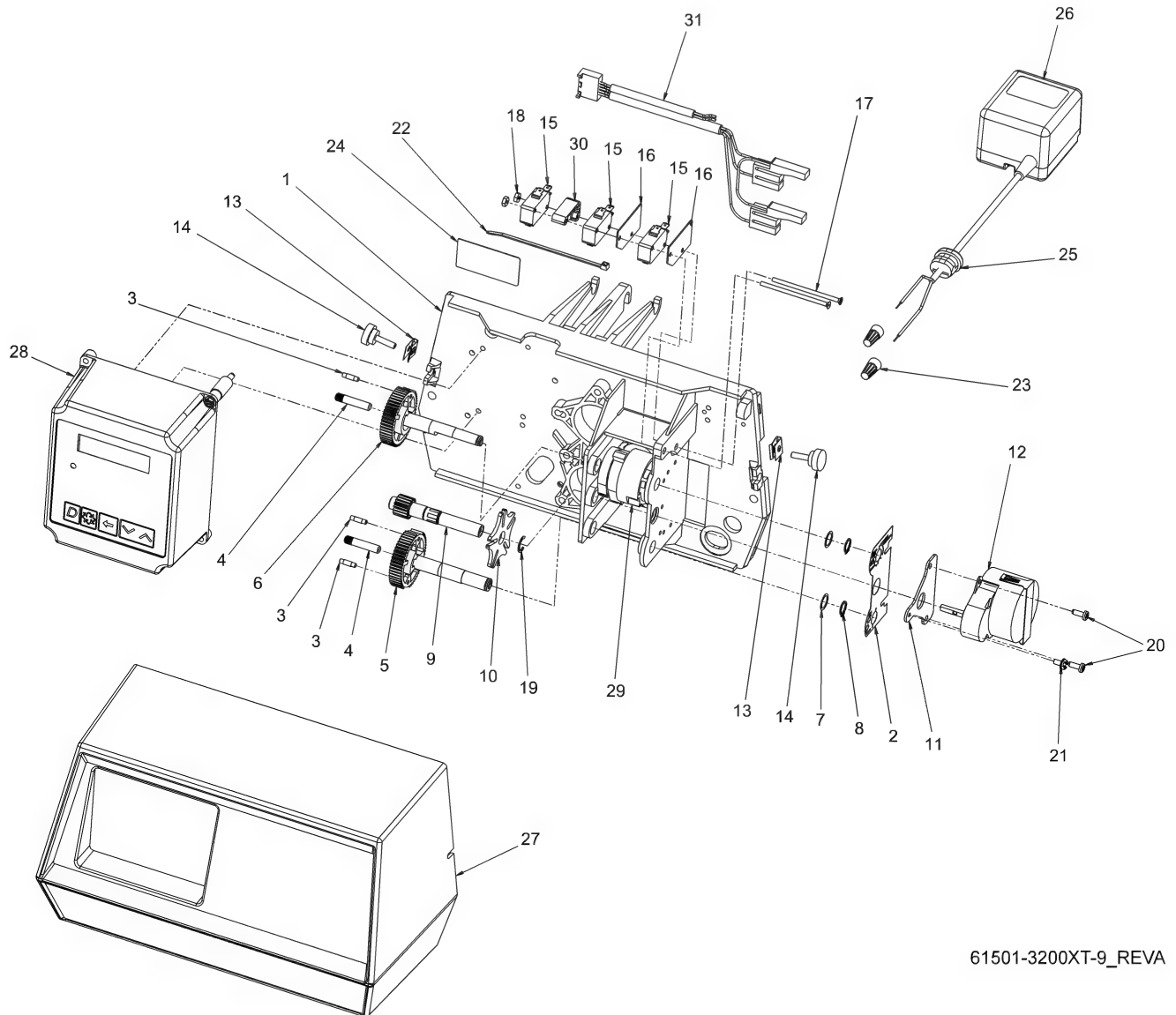
9. Software Version

This program step displays the timer's software program version number.

— Press the Extra Cycle button to exit.

NOTE: Diagnostic Programming Mode will stop if the system goes into a regeneration.

9000/9100/9500 Power Head Assy



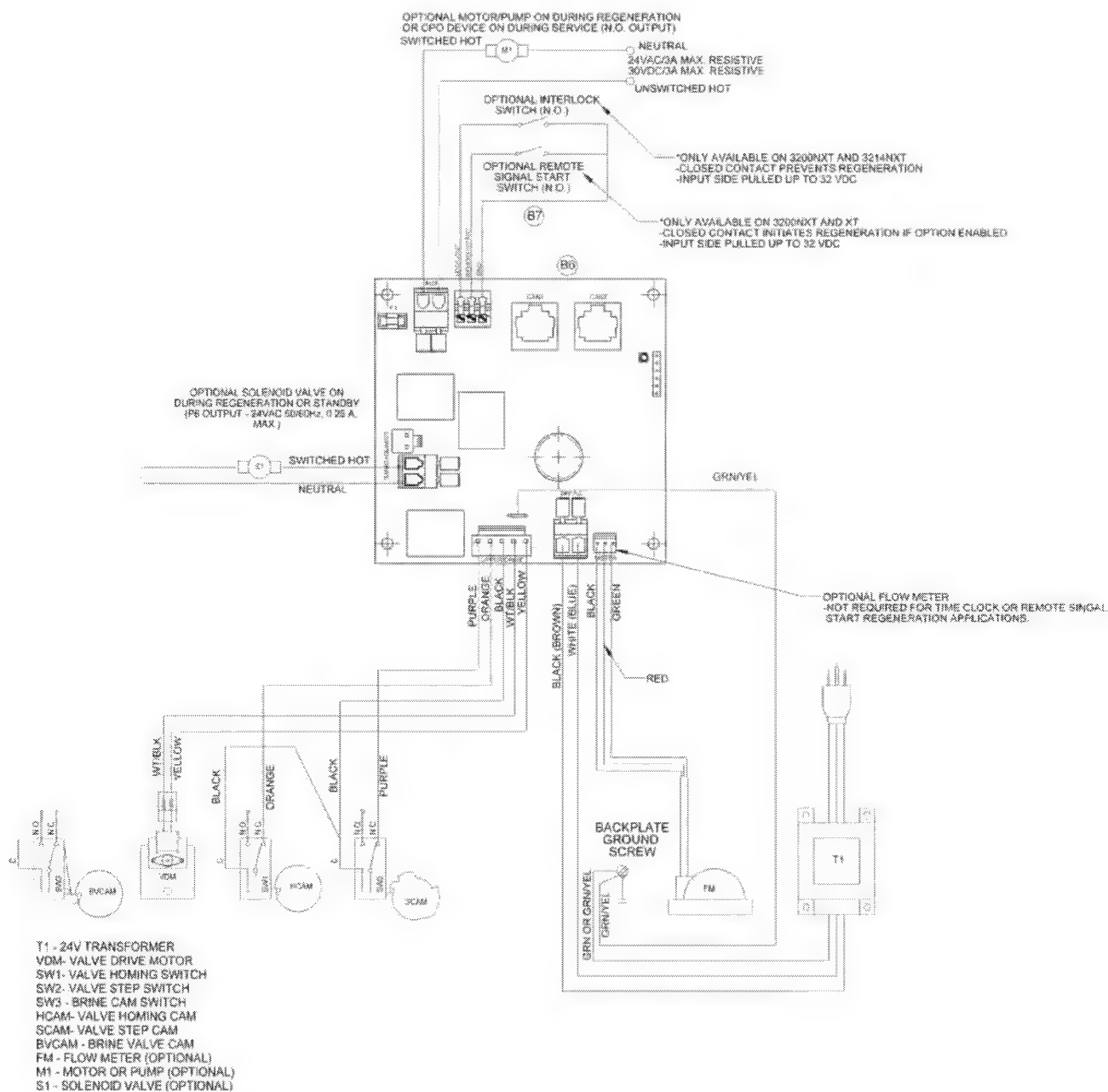
61501-3200XT-9_REVA

9000/9100/9500 Power Head Assy

| Item No. | Quantity | Part No. | Description |
|------------|----------|-----------|---|
| 1 | 1 | 17784-05 | Panel, Control, 9000/9500, ET |
| 2 | 1 | 15175 | Label, Shaft Position |
| 3 | 3 | 15209 | Pin, Roll, 1/8 x 1/2 SS |
| 4 | 2 | 15367 | Pin, Dowel, 9000 |
| 5 | 1 | 17869 | Gear, Drive, 1/2" Stroke |
| 6 | 1 | 17868 | Gear, Drive, 3/4" Stroke, 9000 |
| 7 | 2 | 15692 | Washer, Plain, 3/8" |
| 8 | 2 | 14917 | Ring, Retaining |
| 9 | 1 | 15135 | Gear, Drive, 9000 |
| 10 | 1 | 14896 | Wheel, Geneva |
| 11 | 1 | 15199 | Plate, Ground, 9000/9500 |
| 12 | 1 | 18737 | Motor, 24V, 50/60 Hz, 1 RPM |
| 13 | 2 | 18728 | Nut, Tinneman, U Type, 8-32 |
| 14 | 2 | 19367 | Screw, Designer Cover, Thumb |
| 15 | 3 | 16433 | Switch, Miniature |
| 16 | 2 | 10302 | Insulator, Limit Switch |
| 17 | 2 | 16442 | Screw, Slot Flat Hd, 4-40 x 2.12" |
| 18 | 2 | 10339 | Nut, Hex, 4-40 Zinc Plated |
| 19 | 1 | 15810 | Ring, Retaining |
| 20 | 2 | 19160 | Screw, Phil Pan, Thread, 6-32 x 3/8 |
| 21 | 1 | 14430 | Screw, Hex Wsh St, 6 x 1/4 |
| 22 | 1 | 14044 | Tie, Cable, Heyco VNT# 4-18 |
| 23 | 2 | 40422 | Nut, Wire, Tan |
| 24 | 1 | 41587 | Label, Serial Number, Stock |
| 25 | 1 | 13547-01 | Strain Relief, Euro Round Cord |
| 26 | 1 | 19674 | Transformer, 24V, 9.6VA |
| 27 | 1 | 60232-112 | Cover, Designer, 1 Pc Black |
| 28 | 1 | 42466-02 | Timer Assy, XT, Left Hand |
| 29 | 1 | 17765 | Cam Assy, Aux Switch, 9500 |
| 30 | 1 | 18803-01 | Spacer, Switch, Machd |
| 31 | 1 | 42197 | Wire Harness, 5066, 50DP, 9000, 9100, 9500 XT |
| Not Shown: | | | |
| | 1 | 19121-08 | Meter Cable Assy, NT, 35" 2/Connector |
| | 1 | 19791-02 | Meter Cable Assy, 35" |

NOTE: For all other service part numbers, see the Service Manual that accompanies the control valve.

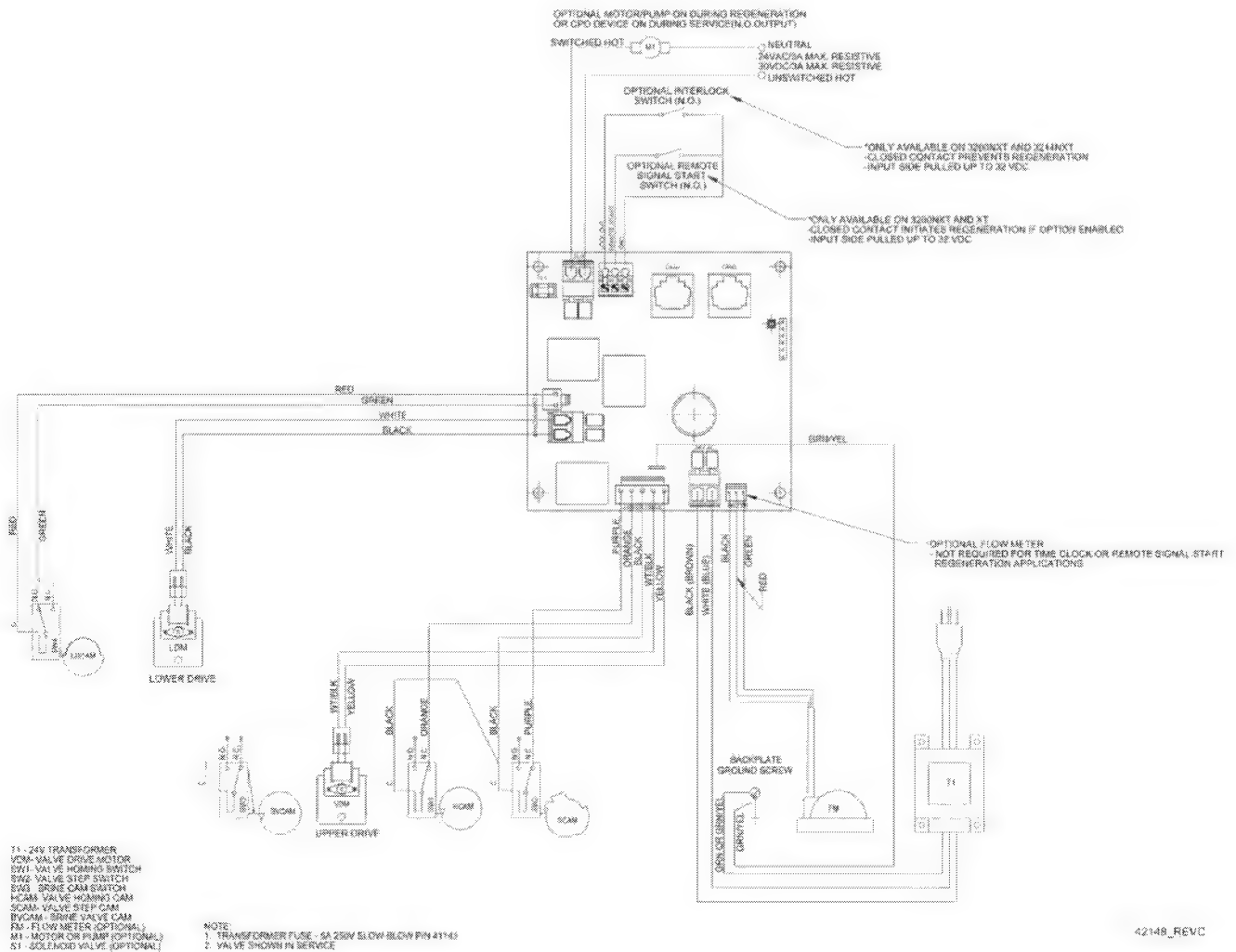
Single Piston Wiring Diagram



NOTE:
 1. TRANSFORMER FUSE - 5A 250V SLOW-BLOW P/N 41143
 2. VALVE SHOWN IN SERVICE

42140_REV0

Dual Piston Wiring Diagram



Troubleshooting - Timer

If an error is detected, an error screen will alternate with the main display screen every few seconds, and the **LED light will be red**.

During an error condition, the unit continues to monitor the flow meter and update the remaining capacity. Once an error condition is corrected, the unit returns to the operating status it was in prior to the error, and regeneration resumes according to normal programming. If an error is cleared by reprogramming the unit in the Master Programming Mode, the volume remaining may be reset to the full unit capacity (as though it had just regenerated). If an error is present, a regeneration can only occur manually by pressing and holding the Extra Cycle button for 5 seconds. If the unit was in regeneration when the error occurred, it will complete the regeneration cycle and go into service.

When the problem is corrected, and the error no longer displays (it may take several seconds for the unit to stop displaying the error message), the unit will return to normal operation. The **LED light** will no longer be **red**, and will turn **Green** if the unit is regenerating, or **Blue** if the unit is in service.

| Problem | Correction |
|---|---|
| A. Flashing/blinking display | A. Power outage has occurred. Either wait 5 minutes for blinking to stop, or press any key on the keypad. |
| B. Unit not responding after going into regeneration | B. Verify the unit is configured correctly (ex: wiring valve type). Perform a Master Reset by holding the Shift button and cycling power. Check and verify the choices selected in Master Programming Mode. |
| C. Unit displays "ERROR CODE: REPLACE UNIT" (corrupted UAP) | C. Contact your local water treatment professional. |

Error Codes

| Error Code | Display Message | Correction |
|------------|-----------------------------|---|
| 01 | ERROR CODE: PROGRAM UNIT | Go through all screens in Master Programming Mode. |
| 02 | ERROR CODE: PROGRAM UNIT | Go through all screens in Master Programming Mode. |
| 03 | ERROR CODE: SERVICE UNIT | Perform a Master Reset by holding the Shift button and cycling power. Go through all screens in Master Programming Mode. Manually initiate a regeneration cycle by pressing the Extra Cycle button for 5 seconds. |
| 04 | ERROR CODE: SERVICE UNIT | Perform a Master Reset by holding the Shift button and cycling power. Go through all screens in Master Programming Mode. Manually initiate a regeneration cycle by pressing the Extra Cycle button for 5 seconds. |
| 05 | ERROR CODE: SERVICE UNIT | Call your local water treatment professional as soon as possible. Leave the unit running (do not unplug). |

NOTE: If the above corrections do not work, please contact your local water treatment professional.

Error Display Screen Examples

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| E | R | R | O | R | | C | O | D | E | : | | | | | |
| S | E | R | V | I | C | E | | U | N | I | T | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| E | R | R | O | R | | C | O | D | E | : | | | | | |
| P | R | O | G | R | A | M | | U | N | I | T | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| E | R | R | O | R | | C | O | D | E | : | | | | | |
| R | E | P | L | A | C | E | | U | N | I | T | | | | |

RES UP Resin Feeder and Cleaner

Res-Up Feeder

This programmed feeder meters the appropriate volume of Pro-ResCare each time the resin bed is regenerated. The Res-Up Feeder can be programmed for the size of resin bed and the quantity of iron or other impurities in the untreated water.

Res-Up Feeders are easy to install and operate.

Pro-ResCare

Pro-ResCare will chemically clean the fouled resin bed of a water softener and restore the exchange capacity of the resin. Most types of water softening resins can become fouled with iron and other contaminants that will affect the performance of the ion exchange system. Iron fouling can cause channeling, pressure drop, loss of capacity, hardness and iron leakage. Regular use of Pro-ResCare will minimize fouling and extend the resin life in the water softener.

Item #45147 Pro-ResCare - Gallon

Item #45148 Pro-ResCare - Quart

Item #33010 Res-Up Feeder with Yellow Wick

Item #33018 Res-Up Feeder with Clear Wick



Application Guide

| Approx. Resin Bed Size | Delivery Feed | Regeneration Cycle (12 Day Clock) | | | | |
|------------------------|---------------|-----------------------------------|----------|----------|----------|----------|
| | | 1 Cycle | 2 Cycles | 3 Cycles | 4 Cycles | 6 Cycles |
| 1/2 cu ft | Light | Yellow | Yellow | Yellow | Yellow | Yellow |
| | Medium | Yellow | Yellow | Yellow | Yellow | Yellow |
| | Heavy | Yellow | Yellow | Yellow | Yellow | Yellow |
| 3/4 cu ft | Light | Yellow | Yellow | Yellow | Yellow | Yellow |
| | Medium | Clear | Yellow | Yellow | Yellow | Yellow |
| | Heavy | Clear | Clear | Yellow | Yellow | Yellow |
| 1.0 cu ft | Light | Clear | Yellow | Yellow | Yellow | Yellow |
| | Medium | Clear | Yellow | Yellow | Yellow | Yellow |
| | Heavy | Clear | Clear | Yellow | Yellow | Yellow |

Note: Pro-ResCare is not to be used with Gel Zeolite. In the event the resin bed is initially contaminated you may add quantities of Pro-ResCare cleaner directly into the brine well to start the cleaning action immediately.

WATERGROUP INC.
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 1-877-288-9888

#57009 Rev. 1/07
 Printed in Canada

MEMBER
 **Water Quality**
 ASSOCIATION

Res-Up® Feeder Installation Instructions

1. Remove top cover, fill the Res-Up® Feeder (plastic container) to the top with water so that the wick retaining clip, tube and wick are wetted, allow to soak for 15 minutes or more.
2. Empty water and pull tube and wick through Feeder until slack is removed from inside. The outlet end tube and wick must be below the bottom level of the Res-Up® Feeder.
3. Drill two 1/4" holes in brine tank as shown in Figure 2.
4. Drill a 5/8" hole in the brine well cap as shown in Figure 3.
5. Clip mounting bracket over feeder with "hooks" pointed up. Insert end of tube in the brine well cap and mounting bracket with the 1/4" holes in the brine tank, rotating feeder downward into position as shown in Figure 1.
6. Fill Feeder with Res-Up® Cleaner to "Fill Line" on label.
7. Replace cover on Feeder and automatic feeding will occur in a few hours

Figure 1

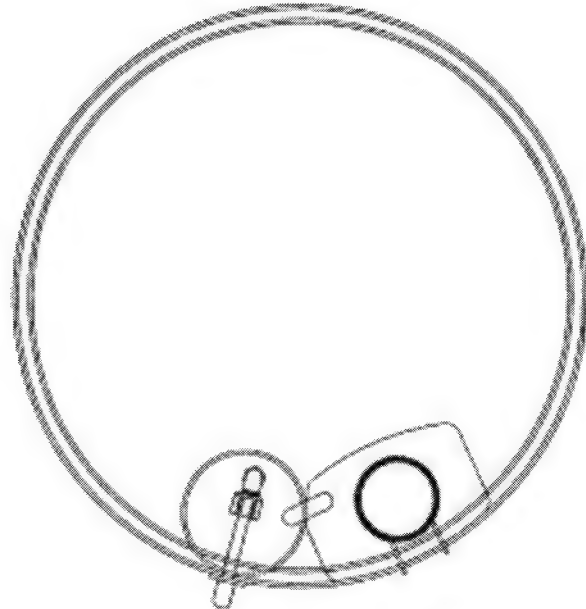


Figure 2

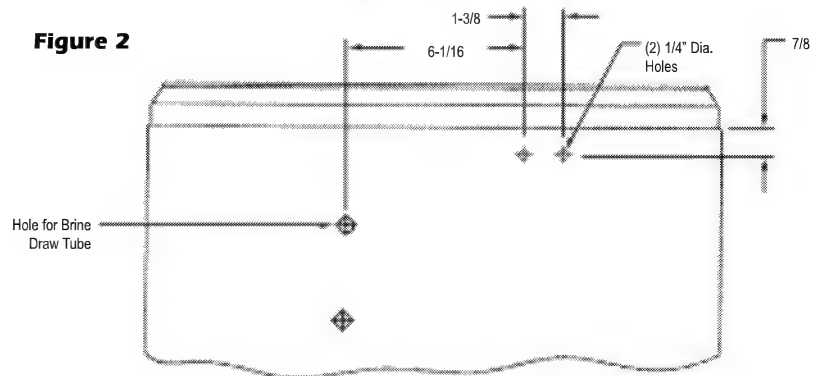
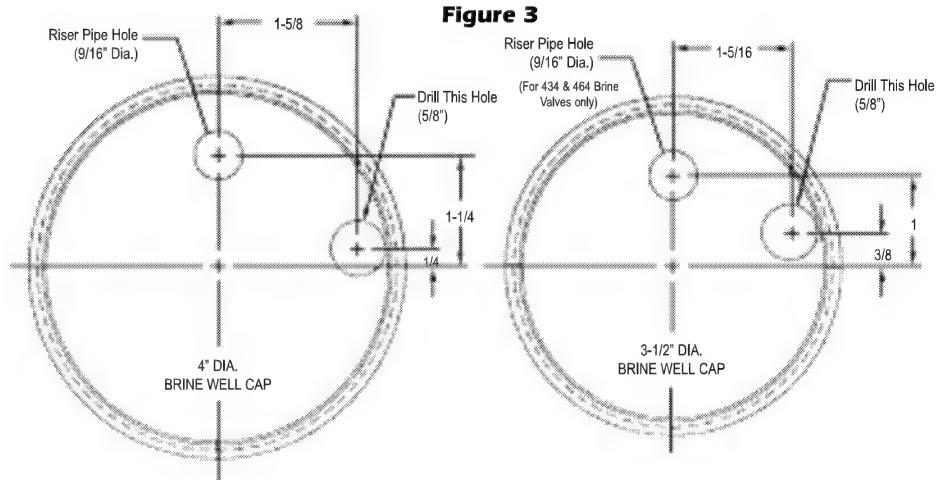


Figure 3



ResCare®

Liquid Resin Cleaner

Resin cleaner maintains performance of softener resin.

Pro Res Care is a specially formulated liquid resin cleaner designed to clean resin pores of iron, manganese, silt, metal particles and organic compounds that cause softener inefficiencies. Regular use of Res Care resin cleaner will restore the softener beads and control valve parts back to peak efficiency and maintain the life of the unit. For best results, use a Res Care Automatic Feeder or manually add during regeneration to prevent mineral build up. Pro Res Care is NSF Certified to meet NSF/ANSI Standard 60 for drinking water additives.

Available in 1 quart, 1/2 gallon and 1 gallon sizes.

Resin Cleaner Applications

First Application: Pour 4 oz. (1/2 cup) of Pro Res Care resin cleaner per cu. ft. directly into brine well (for softeners with no brine well, pour directly into salt tank when salt is low). Manually regenerate softener. Repeat regeneration if taste, odor, or discoloration is detected in discharge, then run cold soft water tap nearest the softener until the odor or taste is gone.

Preventative Maintenance: Add 1/2 oz. (1 Tbsp.) per cu. ft. to brine well before each regeneration.

Automatic Feeder Systems: Click [Here](#) for Pro Easy Feeder



Download MSDS Below

[Res Care® \(English\)](#)

[Res Care® \(French\)](#)



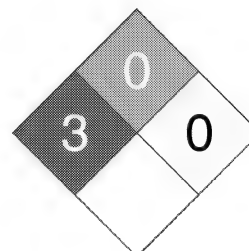
MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Product Name PRO ResCare™
CAS # Mixture
Product use Water Softener Resin Cleaner
Manufacturer Pro Products LLC
 7201 Engle Road
 Fort Wayne, IN 46804-5875 US
 Phone 260-483-2519
 Emergency Phone: 1-800-424-9300 (CHEMTREC)

| LEGEND HMIS/NFPA | |
|---------------------|---|
| Severe | 4 |
| Serious | 3 |
| Moderate | 2 |
| Slight | 1 |
| Minimal | 0 |

| | |
|---------------------|-----|
| Health | / 3 |
| Flammability | 0 |
| Physical Hazard | 0 |
| Personal Protection | B |



2. Hazards Identification

Emergency overview DANGER -- CORROSIVE

Potential short term health effects

Routes of exposure Eye, Skin contact, Inhalation, Ingestion.

Eyes Causes chemical burns. May cause blindness.

Skin Causes chemical burns.

Inhalation Harmful if inhaled. May cause respiratory tract irritation.

Ingestion Harmful if swallowed. May cause chemical burns to mouth, throat and stomach.

Target organs Eyes. Respiratory system. Skin.

Chronic effects Prolonged or repeated exposure to dilutions can cause drying, defatting and dermatitis.

Signs and symptoms The product causes burns of eyes, skin and mucous membranes.

OSHA Regulatory Status This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential environmental effects This product has not been tested.

3. Composition / Information on Ingredients

| Ingredient(s) | CAS # | Percent |
|-----------------|-----------|---------|
| Phosphoric acid | 7664-38-2 | 15 - 40 |

4. First Aid Measures

First aid procedures

Eye contact Immediately flush with cool water. Remove contact lenses, if applicable, and continue flushing for 15 minutes. Obtain medical attention immediately.

Skin contact Immediately flush with water. Wash with soap and water. Obtain medical attention if irritation persists.

Inhalation If symptoms develop move victim to fresh air. If symptoms persist, obtain medical attention.

Ingestion Do not induce vomiting. Never give anything by mouth if victim is unconscious, or is convulsing. Obtain medical attention.

General advice If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Avoid contact with eyes and skin. Keep out of reach of children.

5. Fire Fighting Measures

| | |
|---|---|
| Flammable properties | Not flammable by WHMIS/OSHA criteria. |
| Extinguishing media | |
| Suitable extinguishing media | Treat for surrounding material. |
| Unsuitable extinguishing media | Not available |
| Protection of firefighters | |
| Specific hazards arising from the chemical | Not available |
| Protective equipment for firefighters | Firefighters should wear full protective clothing including self contained breathing apparatus. |
| Hazardous combustion products | May include and are not limited to: Oxides of carbon. Oxides of phosphorus. |
| Explosion data | |
| Sensitivity to mechanical impact | Not available |
| Sensitivity to static discharge | Not available |

6. Accidental Release Measures

| | |
|----------------------------------|---|
| Personal precautions | Keep unnecessary personnel away. Do not touch or walk through spilled material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep people away from and upwind of spill/leak. |
| Environmental precautions | Prevent entry into waterways, sewers, basements or confined areas. |
| Methods for containment | Stop leak if you can do so without risk. |
| Methods for cleaning up | Before attempting clean up, refer to hazard data given above. Small spills may be absorbed with non-reactive absorbent and placed in suitable, covered, labelled containers. Prevent large spills from entering sewers or waterways. Contact emergency services and supplier for advice. Never return spills in original containers for re-use. |

7. Handling and Storage

| | |
|-----------------|--|
| Handling | Use good industrial hygiene practices in handling this material. Do not get this material in your eyes, on your skin, or on your clothing. |
| Storage | Keep out of the reach of children. Store in a closed container away from incompatible materials. |

8. Exposure Controls / Personal Protection

| | |
|---------------------------------------|---|
| Exposure limits | |
| Ingredient(s) | Exposure Limits |
| Phosphoric acid | ACGIH-TLV TWA: 1 mg/m3 STEL: 3 mg/m3 OSHA-PEL TWA: 1 mg/m3 |
| Engineering controls | Use only under good ventilation conditions or with respiratory protection. |
| Personal protective equipment | |
| Eye / face protection | Wear chemical goggles. |
| Hand protection | Rubber gloves. Confirm with a reputable supplier first. |
| Skin and body protection | As required by employer code. Rubber apron recommended. |
| Respiratory protection | Where exposure guideline levels may be exceeded, use an approved NIOSH respirator. |
| General hygiene considerations | Use good industrial hygiene practices in handling this material. When using do not eat or drink. Wash hands before breaks and immediately after handling the product. |

9. Physical and Chemical Properties

| | |
|-------------------|--------|
| Appearance | Clear. |
| Color | Blue |

| | |
|---|----------------|
| Form | Liquid |
| Odor | Characteristic |
| Odor threshold | Not available |
| Physical state | Liquid |
| pH | < 1 |
| Melting point | Not available |
| Freezing point | Not available |
| Boiling point | Not available |
| Pour point | Not available |
| Evaporation rate | Not available |
| Flash point | None |
| Auto-ignition temperature | Not available |
| Flammability limits in air, lower, % by volume | Not available |
| Flammability limits in air, upper, % by volume | Not available |
| Vapor pressure | Not available |
| Vapor density | Not available |
| Specific gravity | 1.10 - 1.11 |
| Octanol/water coefficient | Not available |
| Solubility (H₂O) | Complete |
| Viscosity | Water thin |
| Percent volatile | Not available |

10. Stability and Reactivity

| | |
|---|--|
| Reactivity | Reacts violently with alkaline material. This product may react with reducing agents. |
| Possibility of hazardous reactions | Hazardous polymerization does not occur. |
| Chemical stability | Stable under recommended storage conditions. |
| Conditions to avoid | Do not mix with other chemicals. |
| Incompatible materials | Caustics. Oxidizers. Bases. Reducing agents. |
| Hazardous decomposition products | May include and are not limited to: Oxides of carbon. Oxides of phosphorus. Toxic fumes. |

11. Toxicological Information

Component analysis - LC50

| Ingredient(s) | LC50 |
|----------------------|---------------|
| Phosphoric acid | Not available |

Component analysis - Oral LD50

| Ingredient(s) | LD50 |
|----------------------|----------------|
| Phosphoric acid | 1530 mg/kg rat |

Effects of acute exposure

| | |
|-----------------------------|--|
| Eye | Causes chemical burns. May cause blindness. |
| Skin | Causes chemical burns. |
| Inhalation | Harmful if inhaled. May cause respiratory tract irritation. |
| Ingestion | Harmful if swallowed. May cause chemical burns to mouth, throat and stomach. |
| Sensitization | Non-hazardous by WHMIS/OSHA criteria. |
| Chronic effects | Non-hazardous by WHMIS/OSHA criteria. |
| Carcinogenicity | Not classified or listed by IARC, NTP, OSHA and ACGIH. |
| Mutagenicity | Non-hazardous by WHMIS/OSHA criteria. |
| Reproductive effects | Non-hazardous by WHMIS/OSHA criteria. |
| Teratogenicity | Non-hazardous by WHMIS/OSHA criteria. |

Name of Toxicologically Synergistic Products Not available

12. Ecological Information

| | | |
|--|--|---|
| Ecotoxicity | Because of the low pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems. | |
| Ecotoxicity - Freshwater Fish - Acute Toxicity Data | | |
| Phosphoric acid | 7664-38-2 | 96 Hr LC50 Gambusia affinis: 3 - 3.5 mg/L |
| Ecotoxicity - Water Flea - Acute Toxicity Data | | |
| Phosphoric acid | 7664-38-2 | 12 Hr EC50 Daphnia magna: 4.6 mg/L |
| Persistence / degradability | Not available | |
| Bioaccumulation / accumulation | Not available | |
| Mobility in environmental media | Not available | |
| Environmental effects | Not available | |
| Aquatic toxicity | Not available | |
| Partition coefficient | Not available | |
| Chemical fate information | Not available | |
| Other adverse effects | Not available | |

13. Disposal Considerations

| | |
|--|--|
| Disposal instructions | Review federal, state/provincial, and local government requirements prior to disposal. |
| Waste from residues / unused products | Not available |
| Contaminated packaging | Not available |

14. Transport Information

U.S. Department of Transportation (DOT)

Basic shipping requirements:

| | |
|--------------------------------|--------------------------------|
| Proper shipping name | Phosphoric acid solution |
| Hazard class | 8 |
| UN number | UN1805 |
| Packing group | III |
| Additional information: | |
| Special provisions | A7, IB3, N34, T4, TP1 |
| Packaging exceptions | <5L - Consumer Commodity ORM-D |
| ERG number | 154 |



Transportation of Dangerous Goods (TDG - Canada)

Basic shipping requirements:

| | |
|--------------------------------|--------------------------|
| Proper shipping name | PHOSPHORIC ACID, LIQUID |
| Hazard class | 8 |
| UN number | UN1805 |
| Packing group | III |
| Additional information: | |
| Packaging exceptions | <5L - Consumer Commodity |



15. Regulatory Information

Canadian federal regulations This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Canada - WHMIS - Ingredient Disclosure List

Phosphoric acid 7664-38-2 1 %

WHMIS status Controlled

WHMIS classification Class E - Corrosive Material

WHMIS labeling



Occupational Safety and Health Administration (OSHA)

29 CFR 1910.1200 hazardous chemical Yes

US Federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

Phosphoric acid 7664-38-2 5000 Lb final RQ; 2270 kg final RQ

CERCLA (Superfund) reportable quantity

Phosphoric acid: 5000.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
 Delayed Hazard - No
 Fire Hazard - No
 Pressure Hazard - No
 Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Clean Air Act (CAA) Not available

Clean Water Act (CWA) Not available

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

U.S. - California - 8 CCR Section 339 - Director's List of Hazardous Substances

Phosphoric acid 7664-38-2 Present

U.S. - Louisiana - Reportable Quantity List for Pollutants

Phosphoric acid 7664-38-2 5000 Lb final RQ; 2270 kg final RQ

U.S. - Massachusetts - Right To Know List

Phosphoric acid 7664-38-2 Present

U.S. - Minnesota - Hazardous Substance List

Phosphoric acid 7664-38-2 Present

U.S. - New Jersey - Right to Know Hazardous Substance List

Phosphoric acid 7664-38-2 sn 1516

U.S. - New York - Reporting of Releases Part 597 - List of Hazardous Substances

Phosphoric acid 7664-38-2 5000 Lb RQ (air); 100 lb RQ (land/water)

U.S. - Pennsylvania - RTK (Right to Know) List

Phosphoric acid 7664-38-2 Environmental hazard

U.S. - Rhode Island - Hazardous Substance List

Phosphoric acid 7664-38-2 Toxic; Flammable

Inventory name

| Country(s) or region | Inventory name | On inventory (yes/no)* |
|-----------------------------|---|------------------------|
| Canada | Domestic Substances List (DSL) | Yes |
| Canada | Non-Domestic Substances List (NDSL) | No |
| United States & Puerto Rico | Toxic Substances Control Act (TSCA) Inventory | Yes |

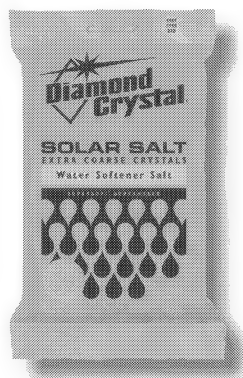
A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

16. Other Information

| | |
|--------------------------|---|
| Disclaimer | Information contained herein was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not available and is so stated. Since conditions of actual product use are beyond control of the supplier, it is assumed that users of this material have been fully trained according to the requirements of all applicable legislation and regulatory instruments. No warranty, expressed or implied, is made and supplier will not be liable for any losses, injuries or consequential damages which may result from the use of or reliance on any information contained in this document. |
| Issue date | 01-Mar-2011 |
| Effective date | 15-May-2011 |
| Expiry date | 15-May-2014 |
| Prepared by | Dell Tech Laboratories Ltd. (519) 858-5021 |
| Other information | For an updated MSDS, please contact the supplier/manufacture listed on the first page of the document. |



High Purity Solar Softener Salt



Diamond Crystal® Extra Coarse Solar Salt

Our high purity water softener salt contains up to 99.6% pure salt. Evaporated naturally by the sun and wind, these solar crystals have a white, opaque appearance and a low insoluble content. They are also formulated to resist mushing and bridging, minimizing the accumulation of brine tank residue.

- Now... poly bags made of 50% recycled material
- NSF certified, this salt is recommended for side-by-side softeners

Extra Coarse Solar Salt



Diamond Crystal® Extra Coarse Solar Salt

| Product | Item Number/ Chep Item Number | Pallet Ct. | Pallet Pattern (tiers) | Pallet Dimensions | Product & Pallet Wt. | Package Cube | Package Dimension | Gross Wt. | GTIN individual (UPC) | GTIN pallet |
|------------------|----------------------------------|---------------|---------------------------|----------------------|-------------------------|-----------------|----------------------|-----------|--------------------------|-------------------|
| 25 lb Poly Bag | n/a | 100 | 10 tiers of 10 | 40x48x36 | 2560 | .58 cu. ft. | 24x14x3 | 25.5 lbs. | 000-13600-01111 6 | 100-13600-01111 3 |
| 25 lb Paper Bag | 100012450/100012451 | 100 | 10 tiers of 10 | 40x48x36 | 2560 | .36 cu. ft. | 21x12x2.5 | 25.5 lbs. | 000-13600-01110 9 | 100-13600-01110 6 |
| 40 lb Poly Bag | 100012411/100012454 | 63 | 9 tiers of 7 | 40x48x36 | 2580 | .90 cu. ft. | 28x16x3.5 | 40.5 lbs. | 000-13600-76940 6 | 100-13600-76940 3 |
| 40 lb Paper Bag | 100012452/100012453 | 63 | 9 tiers of 7 | 40x48x36 | 2580 | .56 cu. ft. | 24x13.5x3 | 40.5 lbs. | 000-13600-01112 3 | 100-13600-01112 0 |
| 50 lb Poly Bag | 100012455/100012456 | 49 | 7 tiers of 7 | 40x48x36 | 2510 | .78 cu. ft. | 27.5x16.5x3 | 50.5 lbs. | 000-13600-74940 8 | 100-13600-74940 5 |
| 50 lb Paper Bag | 100012457/100012458 | 49 | 7 tiers of 7 | 40x48x36 | 2510 | .81 cu. ft. | 25x14x4 | 50.5 lbs. | 000-13600-75940 7 | 100-13600-75940 4 |
| 60 lb Poly Bag | 100012459/100011463 | 40 | 8 tiers of 5 | 40x48x40 | 2450 | .86 cu. ft. | 29x17x3 | 60.5 lbs. | 000-13600-01103 1 | 100-13600-01103 8 |
| 80 lb Poly Bag | 100012445 | 30 | 6 tiers of 5 | 40x48x36 | 2460 | 1.78 cu. ft. | 32x19.25x5 | 80.5 lbs. | 000-13600-72940 0 | 100-13600-72940 7 |
| 20 kg Poly Bag | 100012448 | 56 | 8 tiers of 7 | 40x48x40 | 2549 | 1.02 cu. ft. | 28x15.75x4 | 20.25kg | 000-13600-01106 2 | 100-13600-01106 9 |
| 35 kg Poly Bag | 100012449 | 30 | 6 tiers of 5 | 40x48x34.5 | 2395 | 1.78 cu. ft. | 32.5x19x5 | 35.25kg | 000-13600-01109 3 | 100-13600-01109 0 |
| 18.1kg Poly Bag | 100012127 | 63 | 9 tiers of 7 | 40x48x36 | 2580 | .90 cu. ft. | 28x16x3.5 | 40.5 lbs. | 000-13600-01133 8 | 100-13600-01133 5 |
| 22.7 kg Poly Bag | 100012128 | 49 | 7 tiers of 7 | 40x48x36 | 2510 | .78 cu. ft. | 27.5x16.5x3 | 50.5 lbs. | 000-13600-01134 5 | 100-13600-01134 2 |

All specifications are approximate. Please contact your broker or Cargill representative for exact specifications.

We welcome your questions and comments. Please call us
 at 1-888-385-7258 (SALT) or visit us online at www.diamondcrystalsalt.com.

Cargill Salt

P.O. Box 5621 Minneapolis, MN 55440

File Number 110364

Order Date 17/02/2012

Order Number 10151

Customer Name EMCO MEDICINE HAT

Customer PO 7732544-00

Tag STERNER

Unit 1 COD 20-75TD-2TS - 850 RESIN

PART # 970C0405 B1

CDA VALVE 9100-75" XT

CDA PIPES STANDARD

CDA VALVE SPECS COD 20 DLFC 1.5 REFILL 1 INJECT 3 YELLOW

CYCLE SETTINGS CYCLE TIME BW-10- BD-70 RR-10 REFILL 12

CAPACITY/HARDNESS 6,000 / 3 GRAINS -CONFIRM & SET ON SITE

OTHER

PISTON TYPE STANDARD

METER PADDLE

METER CABLE ELECTRONIC

MINERAL TANK SIZE 12x52 - 2.5" TH <60

QUANTITY 2

DISTRIBUTION 1" CONE

MEDIA BED (FT³) 060- 12-52 A-850 RESIN 2 FT3

MEDIA BED QUANTITY 2

EACH BED
LISTED TOP
TO BOTTOM

FINE GRAVEL 0.16 (16 LBS)

BRINE TANK

140 L C/W SAFETY FLOAT -3/8" TUBING < 60

QUANTITY 1

UNIT COMMENTS



A-850

Strong Base Type I Acrylic Anion Exchange Resin

(For use in demineralization of water containing organic matter)

Technical Data

PRODUCT DESCRIPTION

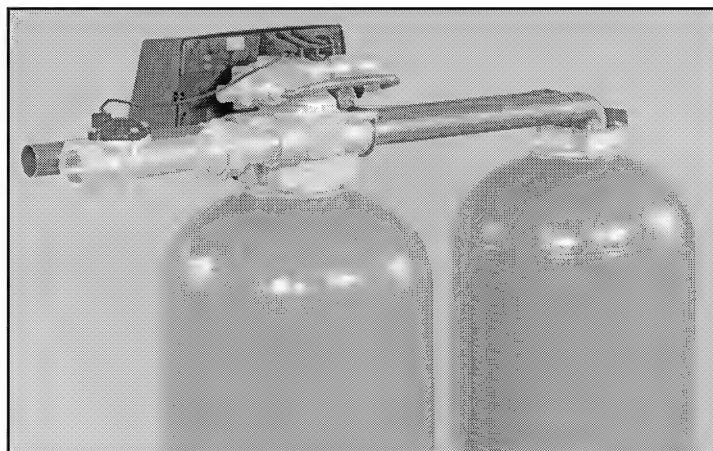
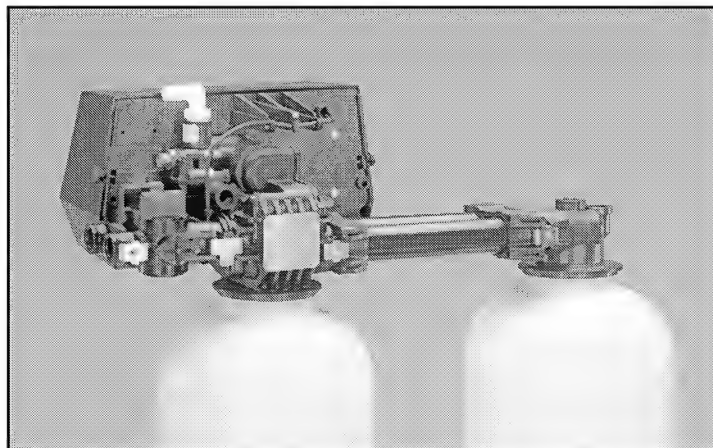
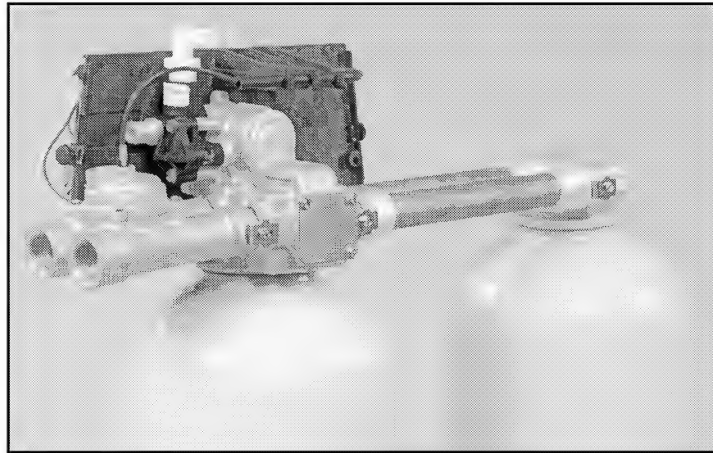
PuroLite A-850 is a gel-type I strong base anion exchange resin with an acrylic matrix. The acrylic matrix ensures excellent removal of organic matter from a water supply in conjunction with its reversible removal upon regeneration. This resin is regenerated very efficiently with lower levels of sodium hydroxide than those required for a polystyrene based type I resin, and yet it

has a comparable ability to remove weaker acids including carbonic acid and silica. Its use in combination with a polystyrene based resin (for instance in a mixed bed positioned after the anion unit) can often result in the removal of a wider spectrum of organic compounds than either type of anion resin alone.

| Typical Physical & Chemical Characteristics | |
|---|-----------------------------------|
| Polymer Matrix Structure | Crosslinked Gel Acrylic |
| Physical Form and Appearance | Transparent White Spherical Beads |
| Whole Bead Count | 95% min. |
| Functional Groups | Quaternary Ammonium |
| Ionic Form, as shipped | Cl ⁻ |
| Shipping Weight (approx.) | 720 g/l (45 lb/ft ³) |
| Screen Size Range: - U.S. Standard Screen | 16 - 50 mesh, wet |
| Particle Size Range | +1.2 mm <5%, -0.3 mm <1% |
| Moisture Retention, Cl ⁻ form | 57 - 62% |
| Irreversible Swelling | 10% max. |
| Reversible Swelling Cl ⁻ → OH ⁻ | 15% max. |
| Specific Gravity, moist Cl ⁻ Form | 1.08 |
| Total Exchange Capacity, Cl ⁻ form, | 1.25 eq/l min. |
| Operating Temperature, Cl ⁻ Form | 40°C (100°F) max. |
| pH Range, Stability | No Limitations |

Model 9000/9100/9500

Service Manual



IMPORTANT: Fill in Pertinent Information on Page 3 for Future Reference



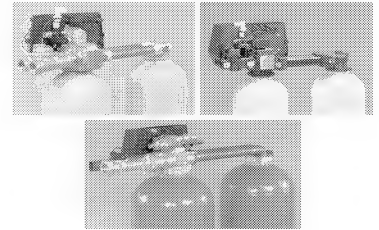
**Pentair
Water**

Fleck Model 9000/9100/9500

Service Manual

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JOB SPECIFICATION SHEET

Job Number: _____
 Model Number: _____
 Water Test: _____
 Capacity Per Unit: _____
 Mineral Tank Size: _____ Diameter: _____ Height: _____
 Brine Tank Size & Salt Setting per Regeneration: _____
 9000/9100/9500 Control Valve Specifications:

1. Type of Timer:

- A. 82 minute available regeneration time, 1/15 RPM
- B. 164 minute available regeneration time, 1/30 RPM

2. Meter Size:

- A. 3/4" Std Range (125 - 2,100 gallon setting)
- B. 3/4" Ext Range (625 - 10,625 gallon setting)
- C. 1" Std Range (310 - 5,270 gallon setting)
- D. 1" Ext Range (1,150 - 26,350 gallon setting)
- E. 1-1/2" Std Range (625 - 10,625 gallon setting)
- F. 1-1/2" Ext Range (3,125 - 53,125 gallon setting)

3. Timer Gallon Setting: _____ Gallons

4. Regeneration Program Setting:

- A. Backwash: _____ Minutes
- B. Brine and Slow Rinse: _____ Minutes
- C. Rapid Rinse: _____ Minutes
- D. Brine Tank Refill: _____ Minutes

5. Drain Line Flow Control: _____ gpm

6. Brine Refill Rate: _____ gpm

7. Injector Size: _____

EQUIPMENT CONFIGURATION

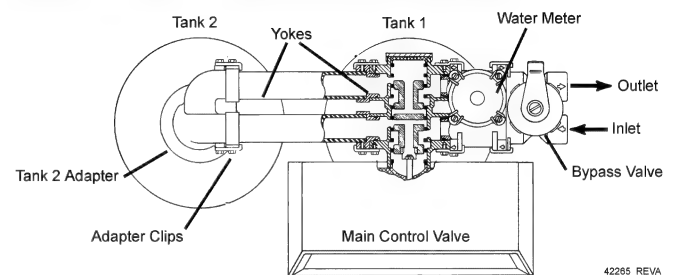


Figure 1 9000/9100 Equipment Configuration

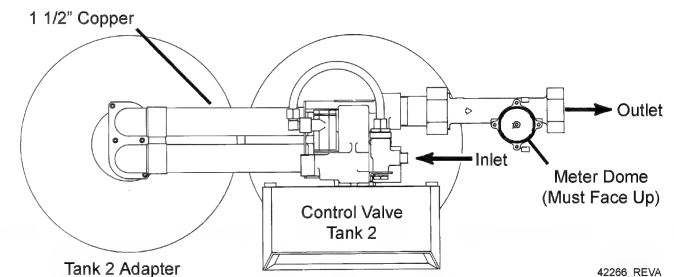


Figure 2 9500 Equipment Configuration

INSTALLATION & START-UP

Water Pressure

A minimum of 25 pounds of water pressure is required for regeneration valve to operate effectively.

Electrical Facilities

A continuous 115 volt, 60 Hertz current supply is required. Make certain the current supply is always hot and cannot be turned off with another switch.

Existing Plumbing

Condition of existing plumbing should be free from lime and iron buildup. Piping that is built up heavily with lime and/or iron should be replaced. If piping is clogged with iron, a separate iron filter unit should be installed ahead of the water softener.

Location Of Softener And Drain

The softener should be located close to a drain.

BY-PASS VALVES

Always provide for the installation of a by-pass valve.

CAUTION Water pressure is not to exceed 125 psi (8.6 bar), water temperature is not to exceed 110°F (43°C), and the unit cannot be subjected to freezing conditions.

1. Place the softener tank where you want to install the unit.

NOTE: Be sure the tank is level and on a firm base.

2. During cold weather it is recommended that the installer warm the valve to room temperature before operating.
3. Perform all plumbing according to local plumbing codes.

- Use a 1/2" minimum pipe size for the drain.
- Use a 3/4" drain line for backwash flow rates that exceed 7 gpm or length that exceeds 20' (6 m).

4. Both tanks must be the same height and diameter and filled with equal amounts of media.
5. The distributor tube must be flush with the top of each tank. Cut if necessary. Use only non-aerosol silicone lubricant.
6. Lubricate the distributor O-ring seal and tank O-ring seal. Place the main control valve on one tank and the tank adapter on the second tank.

NOTE: If required, solder copper tubing for tank interconnection before assembling on the main control valve and tank adapter. Maintain a minimum of 1" distance between tanks on final assembly.

7. Solder joints near the drain must be done before connecting the Drain Line Flow Control fitting (DLFC). Leave at least 6" (152 mm) between the DLFC and solder joints when soldering pipes that are connected on the DLFC. Failure to do this could cause interior damage to DLFC.
8. Use only Teflon tape on the drain fitting.
9. Be sure the floor under the salt storage tank is clean and level.
10. Place approximately 1" (25 mm) of water above the grid plate. If a grid is not utilized, fill to the top of the air check in the salt tank. Do not add salt to the brine tank at this time.
11. On units with a bypass, place in Bypass position.
12. Turn on the main water supply.
13. Open a cold soft water tap nearby and let water run a few minutes or until the system is free of foreign material (usually solder) resulting from the installation. Close the water tap when water runs clean.

2 • NO11 Fleck Model 9000/9100/9500

14. Place the bypass In Service position and let water flow into the mineral tank. When water flow stops, slowly open a cold water tap nearby and let water run until air is purged from the unit. Then close tap.
15. Make all electrical connections according to codes. Plug the valve into an approved power source. Do not insert meter cable into the meter yet.
16. Tank one has control valve and tank two has adapter.
17. Look on the right side of the control valve, it has indicators showing which position the control valve is in during Regeneration and which tank is In Service.

NOTE: Make sure the meter cable is not inserted in the meter dome. Swing the timer out to expose the program wheel. To swing timer out, grab onto the lower right corner of timer face and pull outward.

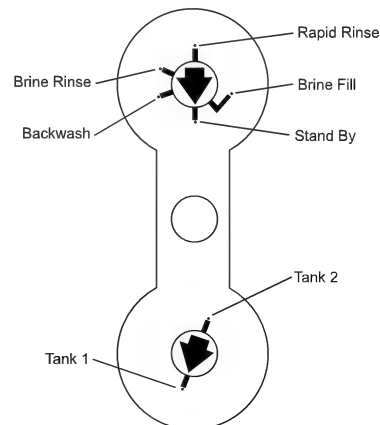
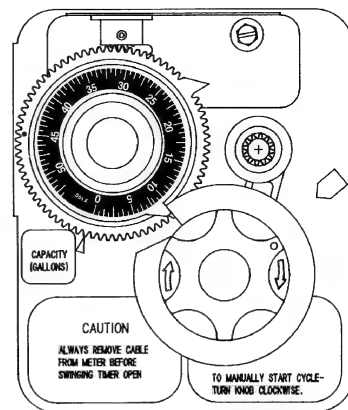
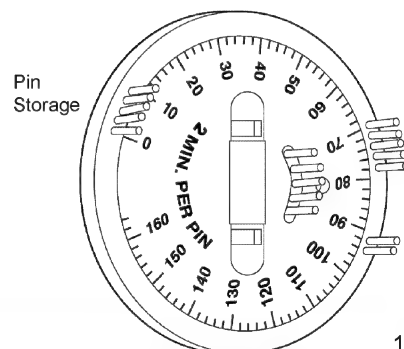


Figure 3 Control Valve Position Indicators



61591 Rev A

Figure 4 Timer



19210 Rev D

Figure 5 Program Wheel

INSTALLATION & START-UP *continued*

18. Cycle timer into backwash position. Turn manual knob so that the micro switch rides on the first set of pins. In this position the tanks switch (lower piston) and the control valve moves to the backwash position (upper piston). Wait until the positioning of upper and lower pistons stops before advancing the timer further. If advanced too fast the control will not home into the In Service position (it will not advance to any other position). To correct this, rotate the manual knob back to In Service and start again into backwash.

NOTE: Once valve positions itself into the backwash cycle, the homing circuit locks in.

19. With all the air backwashed, slowly cycle the timer to the brine position; rapid rinse; and brine tank refill. Wait for the control drive motor to position itself in each cycle and stop, before advancing on to the next position.
20. Once back in the In Service position, cycle the control valve again into the backwash position. The tanks switch again, and air head backwashes out of the other tank. Cycle the control back to the In Service position. Leave the timer in the open position. DO NOT insert meter cable yet.

NOTE: Two motors are available.

1/15 RPM has 82 minute regeneration time.

1/30 RPM has 164 minute regeneration time.

Valve To Tank Installation

1. Spin the valve onto the tank, ensuring the threads are not cross-threaded.

NOTE: All Fleck® valves are right-hand threads, or clockwise, to install

2. Rotate the valve freely without using force until it comes to a stop (this position is considered zero).
3. Rotate the valve clockwise from zero, between ¼ turn and ½ turn (see Figure 6).

NOTE: If lubricant is required, a silicone compound is strongly recommended. Dow Corning® Silicone Compound (available from Fleck®), is recommended for best possible results. Dow Corning® 7 Release Compound is used in the manufacture of Fleck® control valves. The use of other types of lubricants may attack the control's plastic or rubber components. Petroleum-based lubricants can cause swelling in rubber parts, including O-rings and seals.

| Part No. | Description |
|----------|-----------------------|
| 16174 | Silicone, 2 oz Tube |
| 16586-8 | Silicone, Dow #7 8 LB |

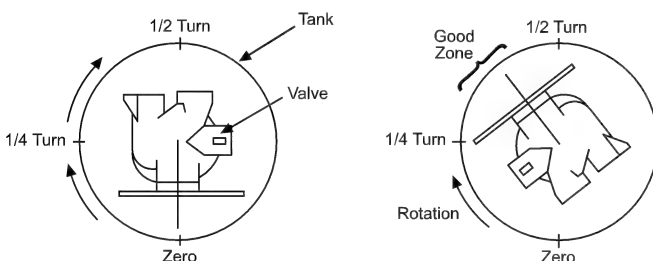


Figure 6

Setting the Regeneration Cycle Program

The Regeneration cycle program on the water conditioner is preset at the factory. However, portions of the cycle or program time may be lengthened or shortened for local conditions or system design.

1. Expose cycle program wheel by grasping timer in lower right hand corner and pulling. This releases snap retainer and swings timer to the left

NOTE: Meter cable must be removed from meter dome before opening timer.

2. Remove the program wheel by grasping program wheel and squeezing protruding lugs towards center. Lift program wheel off timer. Switch arms may require movement to facilitate removal.
3. Return timer to closed position by engaging snap retainer in back plate. Make certain all electrical wires locate above snap retainer post.

Changing Length of the Backwash Time

Looking at the numbered side of the program wheel, the group of pins starting at zero determines the length of time the unit backwashes.

Example: If there are six pins in this section, the time of backwash is 12 minutes (2 minutes per pin). To change the length of backwash time, add or remove pins as required.

The number of pins multiplied by two equals minutes of backwash.

Changing Length of Brine and Rinse Time

The group of holes between the last pin in the backwash section and the second group of pins determines the length of time that a unit will brine and rinse (2 minutes per hole).

To change the length of brine and rinse time, add or remove pins in the rapid rinse group of pins to increase or decrease the number of holes in the brine and rinse section.

The number of holes multiplied by two equals minutes of brine and rinse.

Changing Length Of Rapid Rinse

The second group of pins on the program wheel determines the length of time the water conditioner rapid rinses (2 minutes per pin). To change the length of rapid rinse time, add or remove pins at the higher numbered end of this section as required.

The number of pins multiplied by two equals minutes of rapid rinse.

NOTE: Program wheels with 0–82 minute cycle times, use one minute per pin or hole to set Regeneration times. The layout of pins and holes on the program wheel follow the same procedure as on this page.

Changing Length of Brine Tank Refill Time

The second group of holes on the program wheel determines the length of time the water conditioner refills the brine tank (2 minutes per hole).

To change the length of refill time, move the two pins at the end of the second group of holes as required.

The Regeneration cycle is complete when the two pin set at end of the brine tank refill section trips the outer micro-switch. The program wheel, however, continues to rotate until the inner micro-switch drops into the notch on the program wheel.

INSTALLATION & START-UP *continued*

Programming

1. The control valve is set at the factory for backwash; brine and slow rinse; rapid rinse and brine tank fill times. Change any of these times by repositioning the pins and holes or adding more pins.

NOTE: Two timer motors are available.

1/15 RPM has 82 minute Regeneration Time and each pin or hole equals one minute.

1/30 RPM has 164 minute Regeneration Time and each pin or hole equals two minutes.

2. The control valve has a separate brine tank fill cycle. Calculate the desired salt setting using the brine line flow control rate of refill (in gpm) multiplied by the timer setting. Then, using one gallon of fresh water dissolving approximately 3 lbs salt, calculate the refill time.

Example: A desired 30 lbs salt setting:

The unit has a 1.0 gpm refill rate so a 10 gallon fill is required.

10 gallons x 3 lbs/gals = 30 lbs salt

Set the timer refill section at 10 minutes.

10 minutes x 1.0 gpm = 10 gallon fill

NOTE: There must always be two pins at the end of a refill time to stop the fill cycle. With the Regeneration times set, place timer back to its original position, making sure the lower right hand corner snaps back into the backplate and the meter cable slides through the backplate and does not bind.

3. Setting the gallon wheel. Knowing the amount of resin in each tank and the salt setting per Regeneration, calculate the gallons available, using the following capacities as a guide:

$(\text{capacity per ft}^3 \times \text{ft}^3 \text{ of resin per tank}) = \text{gallons available compensated hardness of H}_2\text{O}$

NOTE: Based on tank size: More resin increases capacity, less resin decreases capacity. More salt increases capacity, less salt decreases capacity.

Example:

| | | |
|---|---|---|
| Tank Diameter | = | 16" |
| Compensated Hardness | = | 35 grains per gallon (tested sample) |
| ft ³ Resin (based on flow rate) | = | 4 |
| Lbs of Salt | = | 8 |
| Capacity per ft ³ | = | 24,000 |
| $(24,000 \times 4 \text{ ft}^3 \text{ of resin per tank})$ 35 grains | = | 2,740 gallons available before regeneration |

Complete step 4 before setting gallons on the meter wheel.

4. Because the control valve regenerates with soft water from the other tank, subtract the water used for regeneration. Take each regeneration cycle and calculate the water used.

Example: Unit is set for a 16" diameter tank with 4 ft³ of resin and salted at 8 lbs. per ft³, 7 gpm backwash, #3 injector, 1.0 gpm brine refill, and 60 psi and timer set for 10 min. backwash, 60 min. brine and rinse, 10 min. rapid rinse, 10 min. brine tank fill.

Backwash 10 min x 7.0 gpm = 70.0 gal

Brine and Rinse 60 min x 1.0 gpm = 60.0 gal

Rapid Rinse 10 min x 7.0 gpm = 70.0 gal

Brine Tank Fill 10 min x 1.0 gpm = 10.0 gal

Total Regeneration Water = 210.0 gal

With the 2740 gallons available calculated in Step 3, subtract the Regeneration water used from the total water available.

2740 gallons available - 210 gallons used = 2530 gallons (in Regeneration, Step 4)

5. Set meter wheel at approximately 2530 gallons. Lift the inner dial of the meter program wheel so that you can rotate it freely. Position the white dot opposite the 2530 gallon setting.

NOTE: There is a slight delay between the time the meter zeros out and the cycle starts. Units using the:

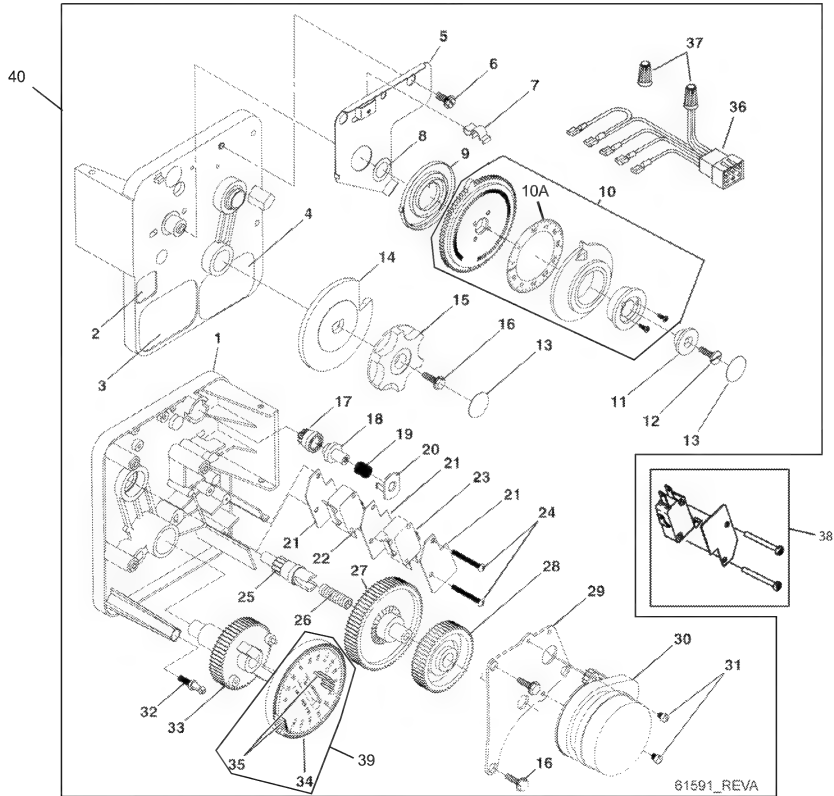
1/15 RPM motor, 82 minute Regeneration Time has a 9 minute delay

1/30 RPM motor, 180 minute Regeneration Time has an 18 minute delay.

NOTE: This delay period is not critical on residential equipment. However, take this factor into consideration for commercial applications by subtracting continuous flows for 9 minutes or 18 minutes from water available.

6. Insert meter cable into meter.
7. Check bypass.
8. Plug in unit.

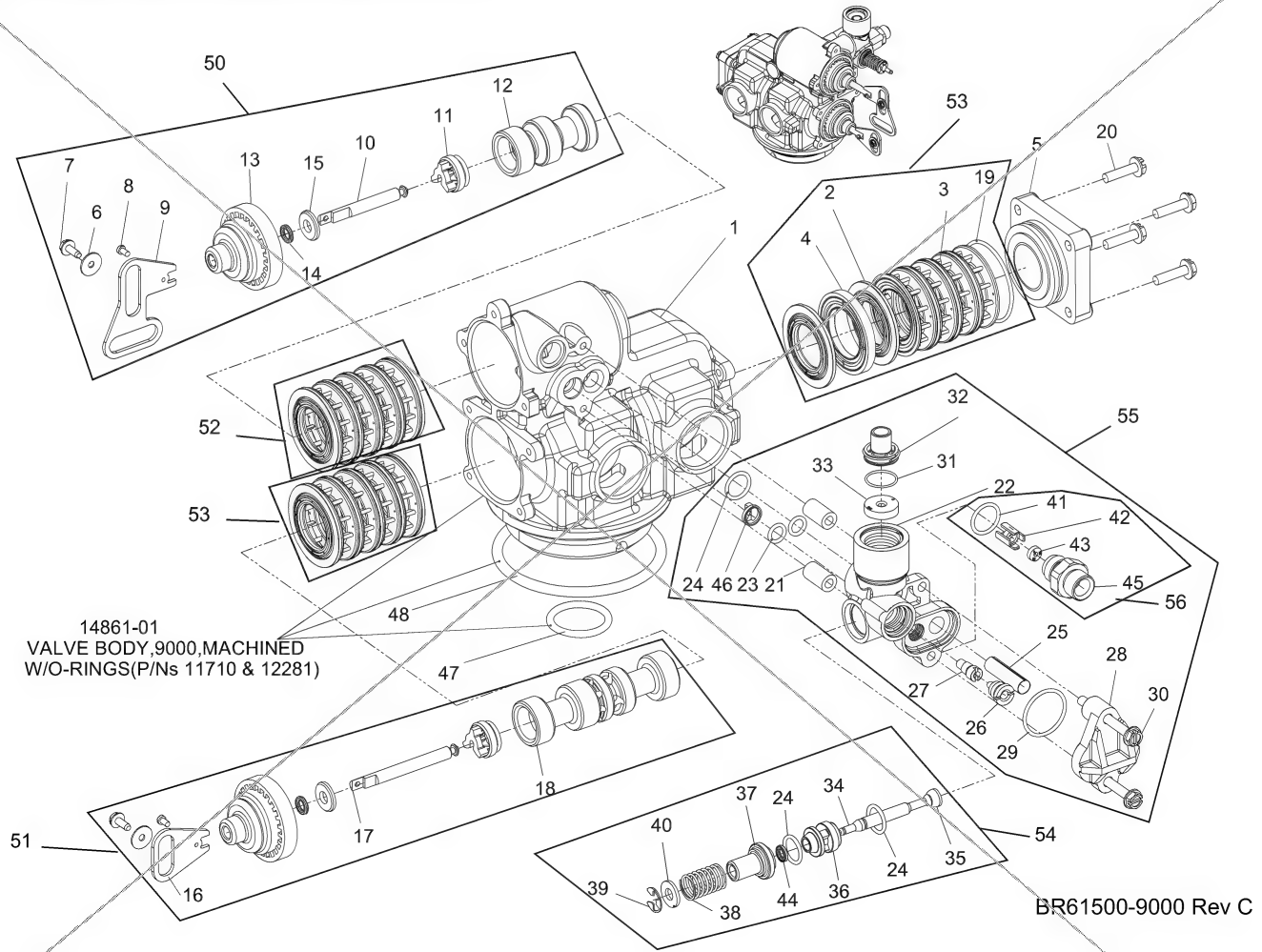
9000/9100/9500 (3200 SERIES) ELECTRO MECHANICAL TIMER ASSEMBLY



| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|--------|---------------|---|----------|---------|---------------|---|
| 1..... | 1..... | 13870-03..... | Housing, Timer, 9000 | 17..... | 1..... | 17724..... | Program Wheel, Pinion Drive |
| 2..... | 1..... | 17870..... | Label, Indicator, 9000 Timer | 18..... | 1..... | 17723..... | Clutch, Drive Pinion |
| 3..... | 1..... | 15465..... | Label, Caution | 19..... | 1..... | 14276..... | Spring, Meter Clutch |
| 4..... | 1..... | 16930..... | Label, Instruction | 20..... | 1..... | 14253..... | Retainer, Clutch Spring |
| 5..... | 1..... | 15227..... | Plate, Clutch, Actuator | 21..... | 3..... | 14087..... | Insulator |
| 6..... | 1..... | 10300..... | Screw, Slot Hex Washer, 18-8 x 3/8 | 22..... | 1..... | 15314..... | Switch, Micro, Modified |
| 7..... | 1..... | 17513..... | Clip, Spring | 23..... | 1..... | 15320..... | Switch, Micro, Timer |
| 8..... | 1..... | 15407..... | Washer, Plain, #4 | 24..... | 2..... | 11413..... | Screw, Pan Hd Mach, 4-40 x 1 1/8 |
| 9..... | 1..... | 15228..... | Spring, Return | 25..... | 1..... | 13018..... | Pinion, Idler |
| 10..... | 1..... | 16270-10..... | Program Wheel Assy, 9000/9100, 3/4" STD, 0-2, 100 | 26..... | 1..... | 18563..... | Spring, Idler Shaft |
| | | 16270-30..... | Program Wheel Assy, 9000/9100, 1" STD, 0-5, 100 | 27..... | 1..... | 13017..... | Gear, Idler |
| | | 16270-40..... | Program Wheel Assy, 9000/9100, 1" EXT, 0-25, 500 | 28..... | 1..... | 13164..... | Gear, Drive |
| | | 16270-50..... | Program Wheel Assy, 9000/9100/9500, 3/4" EXT, 1.5" STD, 0-10, 500 | 29..... | 1..... | 13887..... | Plate, Motor Mounting |
| | | 16270-60..... | Program Wheel Assy, 9500, 1.5" EXT, 0-50, 000 | 30..... | 1..... | 18743-1..... | Motor, 120V, 60 Hz 1/30 RPM, 5600 |
| 10A..... | | 24673..... | Volume Label, Metric, 9000/9100, 3/4" STD, 0-8m3 | | | 18824-1..... | Motor, 230V, 50 Hz 1/30 RPM |
| | | 24672..... | Volume Label, Metric, 9000/9100, 1" STD, 0-20m3 | | | 19170..... | Motor, 120V 60 Hz 1/15 RPM |
| | | 24676..... | Volume Label, Metric, 9000/9100, 1" EXT, 0-100m3 | | | 18825..... | Motor, 230V, 50 Hz 1/15 RPM Mallory |
| | | 24675..... | Volume Label, Metric, 9000/9100/9500, 3/4" EXT, 1.5" STD 0-40m3 | 31..... | 2..... | 13278..... | Screw, Phil Hd Mach, 6-32 x 1/8 Steel Zinc |
| | | 25027..... | Volume Label, Metric, 9500, 1.5" EXT, 1.5" EXT 0-200m3 | 32..... | 1..... | 14265..... | Clip, Spring |
| 11..... | 1..... | 13806..... | Retainer, Program Wheel | 33..... | 1..... | 15055..... | Timer, Main Drive Gear |
| 12..... | 1..... | 13748..... | Screw, Flt Hd St, 6-20 x 1/2 | 34..... | 1..... | 19210-02..... | Program Wheel Assy, 9000 1/15 |
| 13..... | 2..... | 11999..... | Label, Button | | | 19210-05..... | Program Wheel Assy, 9000/3230 |
| 14..... | 1..... | 15223..... | Actuator, Cycle | 35..... | 23..... | 15493..... | Pin, Spring, 1/16 x 5/8 SS |
| 15..... | 1..... | 13886..... | Know, 3200 | 36..... | 1..... | 15203..... | Harness, 9000/9500, Timer |
| 16..... | 4..... | 13296..... | Screw, Hex Washer, 6-20 x 1/2 | 37..... | 2..... | 40422..... | Nut, Wire, Tan |
| | | | | 38..... | 1..... | 60320-02..... | Switch Kit, 3200/9000 Timer Auxiliary |
| | | | | 39..... | | 61420-69..... | Program Wheel & Gear Assy, 5-30-5-10-2, 2 Min Per Pin |
| | | | | | | 61420-80..... | Program Wheel & Gear Assy, 5-40-5-7-2, 2 Min Per Pin |
| | | | | 40..... | 1..... | * | Complete 9000 Meter Immediate Timer Assembly |

*Call your distributor for Part Number

9000 CONTROL VALVE ASSEMBLY



9000 CONTROL VALVE ASSEMBLY

continued

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------------|---------------------------------------|
| 1..... | 1 | 14861..... | Valve Body, 9000 |
| 2..... | 15 | 13242..... | Seal, 5600,9000, 9100 |
| 3..... | 12 | 14241..... | Spacer, 5600,9000, 9100 |
| 4..... | 1 | 16595..... | Spacer, 9000, 9100 |
| 5..... | 1 | 42278..... | End Cap, Plastic, 9000/9100 |
| 6..... | 2 | 13363..... | Washer, Hague Drive |
| 7..... | 2 | 17020..... | Screw, STL. Hex Washer, 6-20 x 3/8 |
| 8..... | 2 | 11335..... | Screw, #4-40 |
| 9..... | 1 | 14921..... | Link, Piston Rod |
| 10..... | 1 | 14919..... | Piston, Rod, Upper |
| 11..... | 2 | 14309..... | Retainer, Piston Rod |
| 12..... | 1 | 14914..... | Piston, 9000, 9100 Upper |
| 13..... | 2 | 13243..... | Plug, End, 5600, 9000, 9100 |
| 14..... | 2 | 10209..... | Quad Ring, -010 |
| 15..... | 2 | 13008..... | Retainer, End Plug Seal |
| 16..... | 1 | 15019..... | Link, Piston Rod, 9000/9500, 9100 |
| 17..... | 1 | 14920..... | Rod, Piston, Lower, 9000, 9100 |
| 18..... | 1 | 14905..... | Piston, 9000, 9100 Lower |
| 19..... | 1 | 40952..... | O-ring, -030 |
| 20..... | 4 | 15331..... | Screw, Hex Washer Head |
| 21..... | 2 | 13361..... | Spacer, 4600, 9000, 9100 |
| 22..... | 1 | 15215..... | Body, Injector, 9000, 9100 |
| 23..... | 2 | 13301..... | O-ring, -011 |
| 24..... | 3 | 13302..... | O-ring, -014 |
| 25..... | 1 | 10227..... | Screen, Injector |
| 26..... | 1 | 10913-000..... | Nozzle, Injector, #000, Brown |
| | | 10913-00..... | Nozzle, Injector, #00, Violet |
| | | 10913-0..... | Nozzle, Injector, #0, Red |
| | | 10913-1..... | Nozzle, Injector, #1, White |
| | | 10913-2..... | Nozzle, Injector, #2, Blue |
| | | 10913-3..... | Nozzle, Injector, #3, Yellow |
| | | 10913-4..... | Nozzle, Injector, #4, Green |
| 27..... | 1 | 10914-000..... | Throat, Injector, #000, Brown |
| | | 10914-00..... | Throat, Injector, #00, Violet |
| | | 10914-0..... | Throat, Injector, #0, Red |
| | | 10914-1..... | Throat, Injector, #1, White |
| | | 10914-2..... | Throat, Injector, #2, Blue |
| | | 10914-3..... | Throat, Injector, #3, Yellow |
| | | 10914-4..... | Throat, Injector, #4, Green |
| 28..... | 1 | 13166..... | Cap, Injector, 5600, 9000, 9100 |
| 29..... | 1 | 13303..... | O-ring, -021 |
| 30..... | 2 | 13387..... | Screw, Hex Washer Head |
| 31..... | 1 | 15348..... | O-ring, -563 |
| 32..... | 1 | 13173-01..... | Retainer, DLFC Button |
| 33..... | 1 | 19153..... | Washer, Flow, 0.6 GPM |
| | | 19152..... | Washer, Flow, 0.8 GPM |
| | | 12097..... | Washer, Flow, 1.0 GPM |
| | | 12085..... | Washer, Flow, 1.2 GPM |
| | | 19150..... | Washer, Flow, 1.3 GPM |
| | | 12086..... | Washer, Flow, 1.5 GPM |

| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------------|---|
| | | 19149..... | Washer, Flow, 1.7 GPM |
| | | 12087..... | Washer, Flow, 2.0 GPM |
| | | 12088..... | Washer, Flow, 2.4 GPM |
| | | 12089..... | Washer, Flow, 3.0 GPM |
| | | 12090..... | Washer, Flow, 3.5 GPM |
| | | 12091..... | Washer, Flow, 4.0 GPM |
| | | 19147..... | Washer, Flow, 4.5 GPM |
| | | 12092..... | Washer, Flow, 5.0 GPM |
| | | 17814..... | Washer, Flow, 6.0 GPM |
| | | 12408..... | Washer, Flow, 7.0 GPM |
| 34..... | 1 | 14925..... | Brine Valve Stem, 9000, 9100 |
| 35..... | 1 | 12626..... | Seat, Brine Valve |
| 36..... | 1 | 13167..... | Spacer, Brine Valve |
| 37..... | 1 | 13165..... | Cap, Brine Valve |
| 38..... | 1 | 11973..... | Spring, Brine Valve |
| 39..... | 1 | 11981-01..... | Ring, Retaining, SS |
| 40..... | 1 | 16098..... | Washer, Nylon Brine |
| 41..... | 1 | 12977..... | O-ring, -015 |
| 42..... | 1 | 13245..... | Retainer, BLFC |
| 43..... | 1 | 17307..... | Washer, Flow, 0.125 GPM |
| | | 12094..... | Washer, Flow, 0.25 GPM |
| | | 12095..... | Washer, Flow, 0.50 GPM |
| | | 12097..... | Washer, Flow, 1.0 GPM |
| 44..... | 1 | 12550..... | Quad Ring, -009 |
| 45..... | 1 | 13244-01..... | Adapter, BLFC |
| 46..... | 1 | 13497..... | Air Disperser, Injector |
| 47..... | 1 | 11710..... | O-ring, -215 |
| 48..... | 1 | 12281..... | O-ring, -338 |
| 50..... | | 60400..... | Piston Assy, 9000, 9100 Upper |
| | | 60400-01..... | Piston Assy, 9000 Upper, HW |
| | | 60400-001..... | Piston Assy, 9000, 9100 Upper, 560CD |
| 51..... | | 60401..... | Piston Assy, 9000, 9100 Lower |
| | | 60401-01..... | Piston Assy, 9000 Lower, HW |
| | | 60401-001..... | Piston Assy, 9000, 9100 Lower, 560CD |
| 52..... | | 60125..... | Seal & Spacer Kit, 5600/9000/9100 Upper |
| | | 60125-15..... | Seal & Spacer Kit, 5600/9000/9100 Upper Blue |
| | | 60125HW..... | Seal & Spacer Kit, 9000 Upper |
| 53..... | | 60421..... | Seal & Spacer Kit, 9000/9100 Lower |
| | | 60421HW..... | Seal & Spacer Kit, 9000 Lower |
| | | 60421-50..... | Seal & Spacer Kit, 9000/9100 Lower, 559PE |
| 54..... | | 60350..... | Brine Valve Assy, 9000, 9100 |
| | | 60350-01..... | Brine Valve Assy, 9000, 560CD, Hot Water |
| 55..... | | 60385-0011..... | Injector Drain, 9000, 9100, 0.25 BLFC #0 INJ, 1.2 DLFC |
| | | 60385-0111..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 1.2 DLFC |

9000 CONTROL VALVE ASSEMBLY

continued

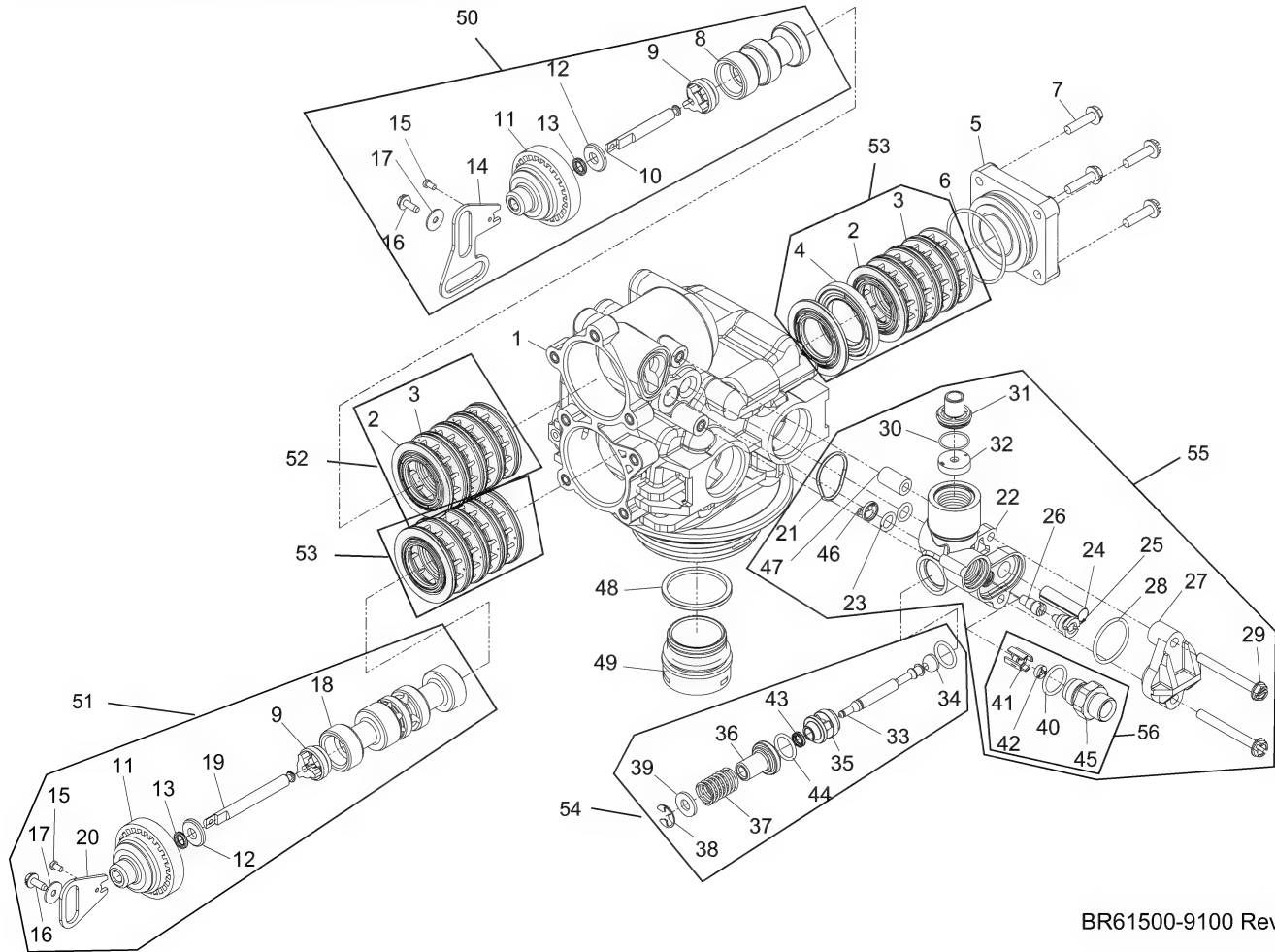
| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|---|
| | | 60385-0121..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 1.5 DLFC |
| | | 60385-0131..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 2.0 DLFC |
| | | 60385-0141..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 2.4 DLFC |
| | | 60385-0012..... | Injector Drain, 9000, 9100, 0.50 BLFC #0 INJ, 1.2 DLFC |
| | | 60385-0112..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 1.2 DLFC |
| | | 60385-0122..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 1.5 DLFC |
| | | 60385-0132..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 2.0 DLFC |
| | | 60385-0142..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 2.4 DLFC |
| | | 60385-0182..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 5.0 DLFC |
| | | 60385-0222..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 1.5 DLFC |
| | | 60385-0242..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 2.4 DLFC |
| | | 60385-0252..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 3.0 DLFC |
| | | 60385-0262..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 3.5 DLFC |
| | | 60385-0272..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 4.0 DLFC |
| | | 60385-0282..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 5.0 DLFC |
| | | 60385-02A2..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 6.0 DLFC |
| | | 60385-0202..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, Blank DLFC |
| | | 60385-0372..... | Injector Drain, 9000, 9100, 0.50 BLFC #3 INJ, 4.0 DLFC |
| | | 60385-0382..... | Injector Drain, 9000, 9100, 0.50 BLFC #3 INJ, 5.0 DLFC |
| | | 60385-0482..... | Injector Drain, 9000, 9100, 0.50 BLFC #4 INJ, 5.0 DLFC |
| | | 60385-0133..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 2.0 DLFC |
| | | 60385-0143..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 2.4 DLFC |
| | | 60385-0163..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 3.5 DLFC |
| | | 60385-0233..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 2.0 DLFC |
| | | 60385-0243..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 2.4 DLFC |
| | | 60385-0253..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 3.0 DLFC |
| | | 60385-0263..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 3.5 DLFC |
| | | 60385-0273..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 4.0 DLFC |
| | | 60385-0353..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 3.0 DLFC |
| | | 60385-0373..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 4.0 DLFC |

| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|--|
| | | 60385-0383..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 5.0 DLFC |
| | | 60385-0393..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 7.0 DLFC |
| | | 60385-0120..... | Injector Drain, 9000, 9100, Blank BLFC #1 INJ, 1.5 DLFC |
| 56..... | | 60022-12..... | BLFC, 0.125 GPM, 5000/5600/9000/9100 |
| | | 60022-25..... | BLFC, 0.25 GPM, 5000/5600/9000/9100 |
| | | 60022-50..... | BLFC, 0.50 GPM, 5000/5600/9000/9100 |
| | | 60022-100..... | BLFC, 1.0 GPM, 5000/5600/9000/9100 |

Not Shown

| | | |
|---------|------------|---------------------------------------|
| 1 | 12128..... | Label, 0.25 GPM BLFC |
| 1 | 13333..... | Label, Injector |
| 1 | 10760..... | Label, 1 GPM, 3 lbs salt/min |
| ..... | 10759..... | Label, 0.5 GPM, 1.5 lbs salt |
| ..... | 19654..... | Label, 0.125 GPM Brine Refill Flow |

9100 CONTROL VALVE ASSEMBLY



BR61500-9100 Rev C

9100 CONTROL VALVE ASSEMBLY

continued

| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-----|----------------|---------------------------------------|----------|------------|------------------------|---|
| 1..... | 1 | 40688..... | Valve Body Assy, 9100 | ..... | 12088..... | Washer, Flow, 2.4 GPM | |
| 2..... | 15 | 13242..... | Seal, 5600,9000, 9100 | ..... | 12089..... | Washer, Flow, 3.0 GPM | |
| 3..... | 12 | 14241..... | Spacer, 5600,9000, 9100 | ..... | 12090..... | Washer, Flow, 3.5 GPM | |
| 4..... | 1 | 16595..... | Spacer, 9000, 9100 | ..... | 12091..... | Washer, Flow, 4.0 GPM | |
| 5..... | 1 | 42278..... | End Cap, Plastic, 9000/9100 | ..... | 19147..... | Washer, Flow, 4.5 GPM | |
| 6..... | 1 | 40952..... | O-ring, -030 | ..... | 12092..... | Washer, Flow, 5.0 GPM | |
| 7..... | 4 | 15331..... | Screw, Hex Washer Head | ..... | 17814..... | Washer, Flow, 6.0 GPM | |
| 8..... | 1 | 14914..... | Piston, 9000, 9100 Upper | ..... | 12408..... | Washer, Flow, 7.0 GPM | |
| 9..... | 2 | 14309..... | Retainer, Piston Rod | 33..... | 1 | 14925..... | Brine Valve Stem, 9000, 9100 |
| 10..... | 1 | 14919..... | Piston, Rod, Upper | 34..... | 1 | 12626..... | Seat, Brine Valve |
| 11..... | 2 | 13243..... | Plug, End, 5600, 9000, 9100 | 35..... | 1 | 13167..... | Spacer, Brine Valve |
| 12..... | 2 | 13008..... | Retainer, End Plug Seal | 36..... | 1 | 13165..... | Cap, Brine Valve |
| 13..... | 2 | 10209..... | Quad Ring, -010 | 37..... | 1 | 11973..... | Spring, Brine Valve |
| 14..... | 1 | 14921..... | Link, Piston Rod | 38..... | 1 | 11981-01..... | Ring, Retaining, SS |
| 15..... | 2 | 11335..... | Screw, #4-40 | 39..... | 1 | 16098..... | Washer, Nylon Brine |
| 16..... | 2 | 17020..... | Screw, STL. Hex Washer, 6-20 x 3/8 | 40..... | 1 | 12977..... | O-ring, -015 |
| 17..... | 2 | 13363..... | Washer, Hague Drive | 41..... | 1 | 13245..... | Retainer, BLFC |
| 18..... | 1 | 14905..... | Piston, 9000, 9100 Lower | 42..... | 1 | 17307..... | Washer, Flow, 0.125 GPM |
| 19..... | 1 | 14920..... | Rod, Piston, Lower, 9000, 9100 | ..... | 12094..... | Washer, Flow, 0.25 GPM | |
| 20..... | 1 | 15019..... | Link, Piston, Rod, 9000/9500 | ..... | 12095..... | Washer, Flow, 0.50 GPM | |
| 21..... | 1 | 41500..... | O-ring, 9100 Drain | ..... | 12097..... | Washer, Flow, 1.0 GPM | |
| 22..... | 1 | 15215..... | Body, Injector, 9000, 9100 | 43..... | 1 | 12550..... | Quad Ring, -009 |
| 23..... | 2 | 13301..... | O-ring, -011 | 44..... | 2 | 13302..... | O-ring, -014 |
| 24..... | 1 | 10227..... | Screen, Injector | 45..... | 1 | 13244-01..... | Adapter, BLFC |
| 25..... | 1 | 10913-000..... | Nozzle, Injector, #000, Brown | 46..... | 1 | 13497..... | Air Dispereser, Injector |
| ..... |  | 10913-00..... | Nozzle, Injector, #00, Violet | 47..... | 1 | 13361..... | Spacer, 4600, 9100 |
| ..... |  | 10913-0..... | Nozzle, Injector, #0, Red | 48..... | 1 | 40538..... | Retainer, 32 mm, O-ring DIST, 7000 |
| ..... |  | 10913-1..... | Nozzle, Injector, #1, White | 49..... | 1 | 61419..... | Kit, 1.05" Distributor Adapter |
| ..... |  | 10913-2..... | Nozzle, Injector, #2, Blue | 50..... | | 60400..... | Piston Assy, 9000, 9100 Upper |
| ..... |  | 10913-3..... | Nozzle, Injector, #3, Yellow | ..... |  | 60400-001..... | Piston Assy, 9000, 9100 Upper, 560CD |
| ..... |  | 10913-4..... | Nozzle, Injector, #4, Green | 51..... | | 60401..... | Piston Assy, 9000, 9100 Lower |
| 26..... | 1 | 10914-000..... | Throat, Injector, #000, Brown | ..... |  | 60401-01..... | Piston Assy, 9000 Lower, HW |
| ..... |  | 10914-00..... | Throat, Injector, #00, Violet | ..... |  | 60401-001..... | Piston Assy, 9000, 9100 Lower, 560CD |
| ..... |  | 10914-0..... | Throat, Injector, #0, Red | 52..... | | 60125..... | Seal & Spacer Kit, 5600/9000/9100 Upper |
| ..... |  | 10914-1..... | Throat, Injector, #1, White | ..... |  | 60125-15..... | Seal & Spacer Kit, 5600/9000/9100 Upper Blue Silicone |
| ..... |  | 10914-2..... | Throat, Injector, #2, Blue | 53..... | | 60421..... | Seal & Spacer Kit, 9000/9100 Lower |
| ..... |  | 10914-3..... | Throat, Injector, #3, Yellow | ..... |  | 60421-50..... | Seal & Spacer Kit, 9000/9100 Lower, 559PE |
| ..... |  | 10914-4..... | Throat, Injector, #4, Green | 54..... | | 60350..... | Brine Valve Assy, 9000, 9100 |
| 27..... | 1 | 13166..... | Cap, Injector, 5600, 9000, 9100 | 55..... | | 60385-0011..... | Injector Drain, 9000, 9100, 0.25 BLFC #0 INJ, 1.2 DLFC |
| 28..... | 1 | 13303..... | O-ring, -021 | ..... |  | 60385-0111..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 1.2 DLFC |
| 29..... | 2 | 13387..... | Screw, Hex Washer Head | ..... |  | 60385-0121..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 1.5 DLFC |
| 30..... | 1 | 15348..... | O-ring, -563 | ..... |  | 60385-0131..... | Injector Drain, 9000, 9100, 0.25 BLFC #1 INJ, 2.0 DLFC |
| 31..... | 1 | 13173-01..... | Retainer, DLFC Button | ..... |  | 60385-0141..... | Injector Drain, 9000, 9100, 0.25 |
| 32..... | 1 | 19153..... | Washer, Flow, 0.6 GPM | | | | |
| ..... |  | 19152..... | Washer, Flow, 0.8 GPM | | | | |
| ..... |  | 12097..... | Washer, Flow, 1.0 GPM | | | | |
| ..... |  | 12085..... | Washer, Flow, 1.2 GPM | | | | |
| ..... |  | 19150..... | Washer, Flow, 1.3 GPM | | | | |
| ..... |  | 12086..... | Washer, Flow, 1.5 GPM | | | | |
| ..... |  | 19149..... | Washer, Flow, 1.7 GPM | | | | |
| ..... |  | 12087..... | Washer, Flow, 2.0 GPM | | | | |

9100 CONTROL VALVE ASSEMBLY

continued

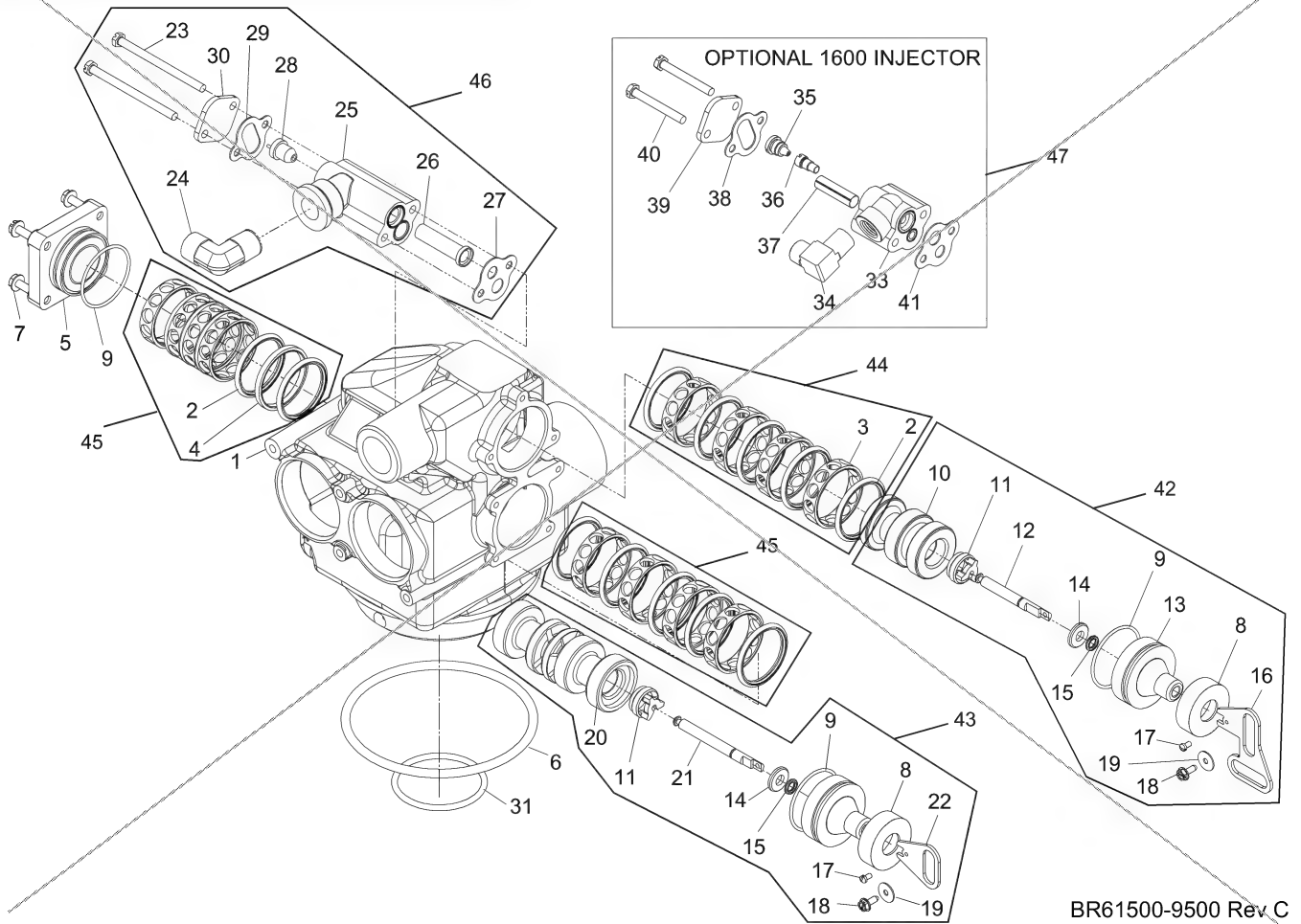
| | |
|-----------------------|---|
| | BLFC #1 INJ, 2.4 DLFC |
| 60385-0012..... | Injector Drain, 9000, 9100, 0.50 BLFC #0 INJ, 1.2 DLFC |
| 60385-0112..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 1.2 DLFC |
| 60385-0122..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 1.5 DLFC |
| 60385-0132..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 2.0 DLFC |
| 60385-0142..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 2.4 DLFC |
| 60385-0182..... | Injector Drain, 9000, 9100, 0.50 BLFC #1 INJ, 5.0 DLFC |
| 60385-0222..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 1.5 DLFC |
| 60385-0242..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 2.4 DLFC |
| 60385-0252..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 3.0 DLFC |
| 60385-0262..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 3.5 DLFC |
| 60385-0272..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 4.0 DLFC |
| 60385-0282..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 5.0 DLFC |
| 60385-02A2..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, 6.0 DLFC |
| 60385-0202..... | Injector Drain, 9000, 9100, 0.50 BLFC #2 INJ, Blank DLFC |
| 60385-0372..... | Injector Drain, 9000, 9100, 0.50 BLFC #3 INJ, 4.0 DLFC |
| 60385-0382..... | Injector Drain, 9000, 9100, 0.50 BLFC #3 INJ, 5.0 DLFC |
| 60385-0482..... | Injector Drain, 9000, 9100, 0.50 BLFC #4 INJ, 5.0 DLFC |
| 60385-0133..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 2.0 DLFC |
| 60385-0143..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 2.4 DLFC |
| 60385-0163..... | Injector Drain, 9000, 9100, 1.0 BLFC #1 INJ, 3.5 DLFC |
| 60385-0233..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 2.0 DLFC |
| 60385-0243..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 2.4 DLFC |
| 60385-0253..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 3.0 DLFC |
| 60385-0263..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 3.5 DLFC |
| 60385-0273..... | Injector Drain, 9000, 9100, 1.0 BLFC #2 INJ, 4.0 DLFC |
| 60385-0353..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 3.0 DLFC |
| 60385-0373..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 4.0 DLFC |
| 60385-0383..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 5.0 DLFC |
| 60385-0393..... | Injector Drain, 9000, 9100, 1.0 BLFC #3 INJ, 7.0 DLFC |
| 60385-0120..... | Injector Drain, 9000, 9100, Blank |

| Item No. | QTY | Part No. | Description |
|----------|-----|----------------------|---|
| | | | BLFC #1 INJ, 1.5 DLFC |
| 56..... | | 60022-12..... | BLFC, 0.125 GPM, 5000/5600/9000/9100 |
| | | 60022-25..... | BLFC, 0.25 GPM, 5000/5600/9000/9100 |
| | | 60022-50..... | BLFC, 0.50 GPM, 5000/5600/9000/9100 |
| | | 60022-100..... | BLFC, 1.0 GPM, 5000/5600/9000/9100 |

Not Shown

| | | |
|---------|------------|---------------------------------------|
| 1 | 13333..... | Label, Injector |
| 1 | 10759..... | Label, 0.5 GPM, 1.5 lbs salt/min |
| ..... | 18569..... | Retainer, Tank Seal |
| ..... | 18303..... | O-ring, -336, Top of Tank |
| ..... | 12128..... | Label, 0.25 GPM BLFC |
| ..... | 10760..... | Label 1 GPM, 3 lbs Salt |
| ..... | 19654..... | Label, 0.125 GPM Brine Refill Flow |

9500 CONTROL VALVE ASSEMBLY



BR61500-9500 Rev C

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|-------------------------------------|
| 1..... | 1 | 16919..... | Valve Body, 9500, Machining |
| 2..... | 15 | 16101..... | Seal, 2850, 4500 |
| | | 41113..... | Seal, 2850, 559PE |
| 3..... | 12 | 16638..... | Spacer, 9500/2850, Cold & Hot Water |
| | | 16638-02..... | Spacer, 9500/2850, MS1050, Plastic |
| 4..... | 1 | 17092..... | Spacer, Disc, 9500 |
| 5..... | 1 | 42278-01..... | End Cap, Plastic, 9500 |
| 6..... | 1 | 16455..... | O-ring, -347 |
| 7..... | 4 | 15331..... | Screw, Hex Washer Head |
| 8..... | 2 | 17558..... | Disc, Spacer, End Plug |
| 9..... | 3 | 16394..... | O-ring, -029 |
| 10..... | 1 | 17110..... | Piston, 9500, Upper |
| 11..... | 2 | 14309..... | Retainer, Piston Rod |
| 12..... | 1 | 16957..... | Rod, Piston, 9500 |
| 13..... | 2 | 16954..... | Plug, End, 9500 |
| 14..... | 2 | 13008..... | Retainer, End Plug Seal |
| 15..... | 2 | 10209..... | Quad Ring, -010 |
| 16..... | 1 | 14921..... | Link, Piston Rod |
| 17..... | 2 | 11335..... | Screw, #4-40 |
| 18..... | 2 | 17020..... | Screw, STL. Hex Washer, 6-20 x 3/8 |
| 19..... | 2 | 13363..... | Washer, Plain, .145 ID S.S. |
| 20..... | 1 | 17111..... | Piston, 9500, Lower |
| 21..... | 1 | 16956..... | Rod, Piston, Lower, 9500 |
| 22..... | 1 | 15019..... | Link, Piston Rod, 9000/9500, 9100 |
| 23..... | 2 | 14804..... | Screw, Slotted Hex Head |

| Item No. | QTY | Part No. | Description |
|----------|-----|----------------|--------------------------------------|
| 24..... | 1 | 15413..... | Fitting, Elbow, Male, 1/2 TX 3/8 NPT |
| 25..... | 1 | 17777-03..... | Body, Injector, 1700 |
| 26..... | 1 | 14802-03C..... | Throat, Injector, #3C, Yellow |
| | | 14802-04C..... | Throat, Injector, #4C, Green |
| | | 14802-05C..... | Throat Injector, #5C, White |
| | | 14802-06C..... | Throat Injector, #6C, Red |
| 27..... | 1 | 14805..... | Gasket, Injector Body |
| 28..... | 1 | 14801-03C..... | Nozzle, Injector, 3C, Yellow |
| | | 14801-04C..... | Nozzle, Injector, 4C, Green |
| | | 14801-05C..... | Nozzle, Injector, 5C, White |
| | | 14801-06C..... | Nozzle, Injector, 6C, Red |
| 29..... | 1 | 10229..... | Gasket, Injector Body |
| 30..... | 1 | 11893..... | Cap, Injector |
| 31..... | 1 | 13577..... | O-ring, -226 |

Optional (1600) Injector Part Number

| | | | |
|---------|---|--------------|--------------------------------|
| 33..... | 1 | 17776..... | Body, Injector, 1600 |
| 34..... | 1 | 10328..... | Fitting, Elbow, 90 Deg. |
| 35..... | 1 | 10913-1..... | Nozzle, Injector, #1, Natural |
| 36..... | 1 | 10914..... | Throat, Injector |
| 37..... | 1 | 10227..... | Screen, Injector |
| 38..... | 1 | 10229..... | Gasket, Injector Body |
| 39..... | 1 | 11893..... | Cap, Injector |
| 40..... | 1 | 10692..... | Screw, Slot, Indented Hex Head |
| 41..... | 1 | 14805..... | Gasket, Injector Body |

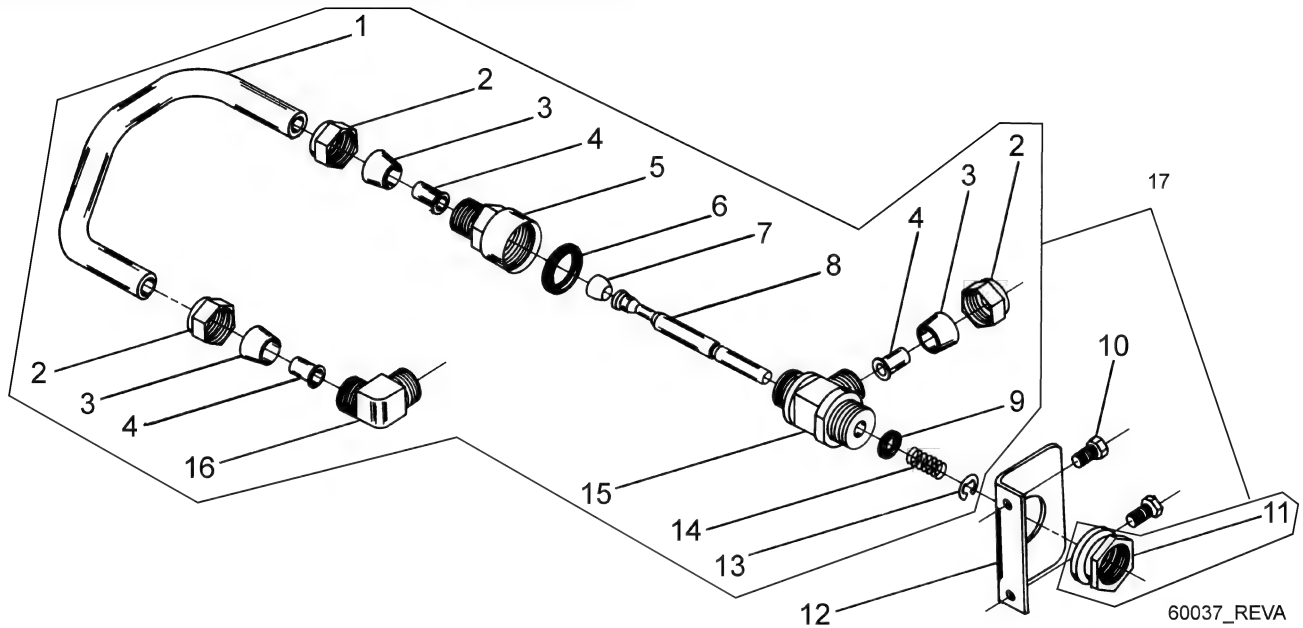
9100 CONTROL VALVE ASSEMBLY

continued

| Item No. | QTY | Part No. | Description |
|------------------|-----|---------------------|---|
| 42..... | | 60108..... | Piston Assy, 9500, Upper |
| | | 60108-01..... | Piston Assy, 9500, Upper, HW |
| | | 60108-02..... | Piston Assy, 9500, Upper, 560CD |
| 43..... | | 60109..... | Piston Assy, 9500, Lower |
| | | 60109-01..... | Piston Assy, 9500, HW, Lower |
| | | 60109-02..... | Piston Assy, 9500, Lower, 560CD |
| 44..... | | 60134..... | Seal & Spacer Kit, 9500, Upper, Hot & Cold |
| | | 60134-20..... | Seal & Spacer Kit, 9500, Upper, Plastic Spacers |
| | | 60134-30..... | Seal & Spacer Kit, 9500, Upper, Plastic Spacers, Chemical Resistent Seals |
| 45..... | | 60133-01..... | Seal & Spacer Kit, 9500, Lower, Hot & Cold |
| | | 60133-20..... | Seal & Spacer Kit, 9500, Lower, Plastic Spacers |
| | | 60133-30..... | Seal & Spacer Kit, 9500, Upper, Plastic Spacers, Chemical Resistent Seals |
| 46..... | | 60381-03..... | Injector Assy, 1700, #3C |
| | | 60381-04..... | Injector Assy, 1700, #4C |
| | | 60381-05..... | Injector Assy, 1700, #5C |
| | | 60381-06..... | Injector Assy, 1700, #6C |
| 47..... | | 60480-00..... | Injector Assy, 1600, #0, Plastic |
| | | 60480-01..... | Injector Assy, 1600, #1, Plastic |
| | | 60480-02..... | Injector Assy, 1600, #2, Plastic |
| | | 60480-03..... | Injector Assy, 1600, #3, Plastic |
| | | 60480-04..... | Injector Assy, 1600, #4, Plastic |
| | | 60481-21..... | Injector Assy, 1600, #1, S.S. Brass, HW |
| | | 60481-22..... | Injector Assy, 1600, #2, S.S. Brass, HW |
| | | 60481-23..... | Injector Assy, 1600, #3, S.S. Brass, HW |
| | | 60080-11..... | Injector Assy, 1600, #1, PVC |
| | | 60080-12..... | Injector Assy, 1600, #2, PVC |
| | | 60080-14..... | Injector Assy, 1600, #4, PVC |
| Not Shown | | | |
| | | 60366-00..... | DLFC, 1"F x 3/4"F, NPT, No Button |
| | | 60366-06..... | DLFC, 1"F x 3/4"F, NPT, 0.6 GPM |
| | | 60366-08..... | DLFC, 1"F x 3/4"F, NPT, 0.8 GPM |
| | | 60366-10..... | DLFC, 1"F x 3/4"F, NPT, 1.0 GPM |
| | | 60366-12..... | DLFC, 1"F x 3/4"F, NPT, 1.2 GPM |
| | | 60366-13..... | DLFC, 1"F x 3/4"F, NPT, 1.3 GPM |
| | | 60366-15..... | DLFC, 1"F x 3/4"F, NPT, 1.5 GPM |
| | | 60366-17..... | DLFC, 1"F x 3/4"F, NPT, 1.7 GPM |
| | | 60366-20..... | DLFC, 1"F x 3/4"F, NPT, 2.0 GPM |
| | | 60366-24..... | DLFC, 1"F x 3/4"F, NPT, 2.4 GPM |
| | | 60366-30..... | DLFC, 1"F x 3/4"F, NPT, 3.0 GPM |
| | | 60366-35..... | DLFC, 1"F x 3/4"F, NPT, 3.5 GPM |
| | | 60366-40..... | DLFC, 1"F x 3/4"F, NPT, 4.0 GPM |
| | | 60366-45..... | DLFC, 1"F x 3/4"F, NPT, 4.5 GPM |

| Item No. | QTY | Part No. | Description |
|----------|-----|----------------------|--|
| | | 60366-50..... | DLFC, 1"F x 3/4"F, NPT, 5.0 GPM |
| | | 60366-60..... | DLFC, 1"F x 3/4"F, NPT, 6.0 GPM |
| | | 60366-70..... | DLFC, 1"F x 3/4"F, NPT, 7.0 GPM |
| | | 60708-00..... | DLFC, 1"F x 3/4"F, NPT, No Button |
| | | 60708-8.0..... | DLFC, 1"F x 3/4"F, NPT, 8.0 GPM |
| | | 60708-9.0..... | DLFC, 1"F x 3/4"F, NPT, 9.0 GPM |
| | | 60708-10..... | DLFC, 1"F x 3/4"F, NPT, 10.0 GPM |
| | | 60708-12..... | DLFC, 1"F x 3/4"F, NPT, 12.0 GPM |
| | | 60708-15..... | DLFC, 1"F x 3/4"F, NPT, 15.0 GPM |
| | | 60721-00..... | DLFC, 1"F x 1"F, NPT, No Button |
| | | 60721-06..... | DLFC, 1"F x 1"F, NPT, 0.06 GPM |
| | | 60721-08..... | DLFC, 1"F x 1"F, NPT, 0.08 GPM |
| | | 60721-10..... | DLFC, 1"F x 1"F, NPT, 1.0 GPM |
| | | 60721-12..... | DLFC, 1"F x 1"F, NPT, 1.2 GPM |
| | | 60721-13..... | DLFC, 1"F x 1"F, NPT, 1.3 GPM |
| | | 60721-15..... | DLFC, 1"F x 1"F, NPT, 1.5 GPM |
| | | 60721-00..... | DLFC, 1"F x 1"F, NPTF, No Button |
| | | 60721-17..... | DLFC, 1"F x 1"F, NPTF, 1.7 GPM |
| | | 60721-20..... | DLFC, 1"F x 1"F, NPTF, 2.0 GPM |
| | | 60721-24..... | DLFC, 1"F x 1"F, NPTF, 2.4 GPM |
| | | 60721-30..... | DLFC, 1"F x 1"F, NPTF, 3.0 GPM |
| | | 60721-35..... | DLFC, 1"F x 1"F, NPTF, 3.5 GPM |
| | | 60721-40..... | DLFC, 1"F x 1"F, NPTF, 4.0 GPM |
| | | 60721-45..... | DLFC, 1"F x 1"F, NPTF, 4.5 GPM |
| | | 60721-50..... | DLFC, 1"F x 1"F, NPTF, 5.0 GPM |
| | | 60721-60..... | DLFC, 1"F x 1"F, NPTF, 6.0 GPM |
| | | 60721-70..... | DLFC, 1"F x 1"F, NPTF, 7.0 GPM |
| | | 60702-00..... | DLFC, 1"M x 1"F, NPT, Brass, No Button |
| | | 60702-8.0..... | DLFC, 1"M x 1"F, NPT, 8.0 GPM |
| | | 60702-9.0..... | DLFC, 1"M x 1"F, NPT, 9.0 GPM |
| | | 60702-10..... | DLFC, 1"M x 1"F, NPT, 10 GPM |
| | | 60702-12..... | DLFC, 1"M x 1"F, NPT, 12 GPM |
| | | 60702-15..... | DLFC, 1"M x 1"F, NPT, 15 GPM |

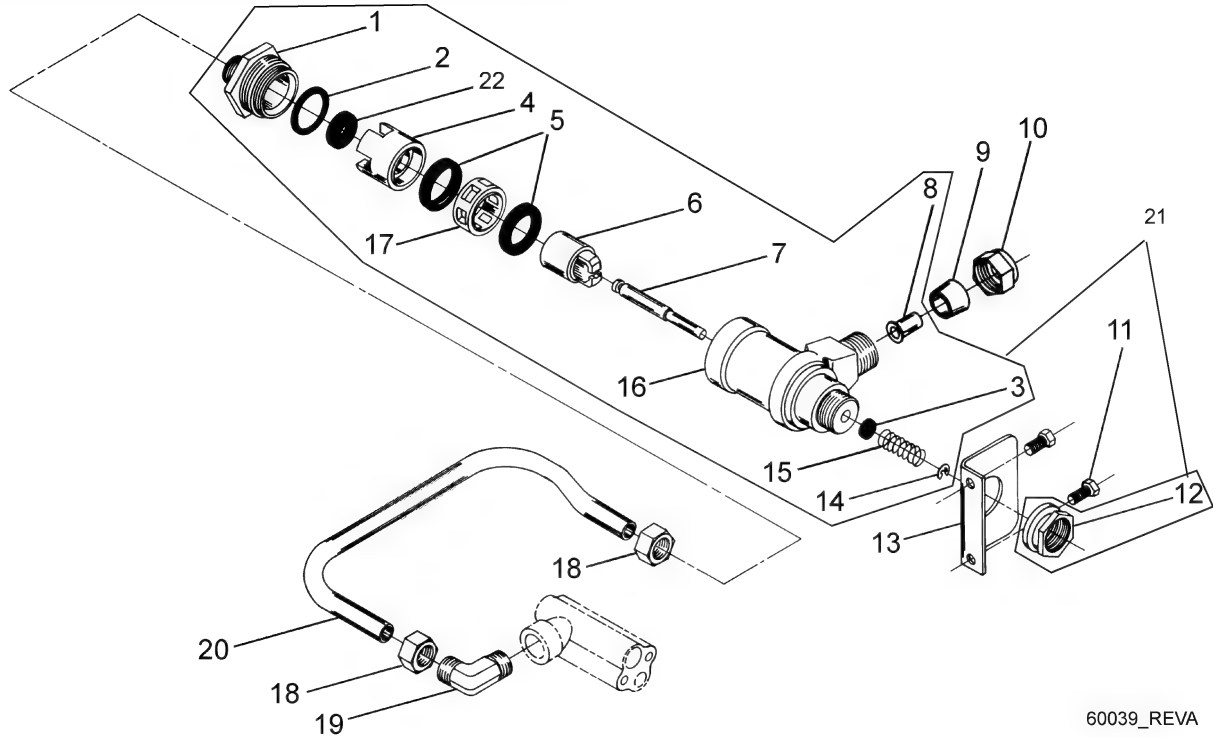
1600 BRINE VALVE SYSTEM (FOR 9500)



60037_REVA

| Item No. | QTY | Part No. | Description |
|----------|---------|----------------|--|
| 1..... | 1 | 16960..... | Tube, Brine Valve |
| | 1 | 16960..... | Tube, Brine Valve, HW |
| 2..... | 1 | 10329..... | Fitting, Tube, 3/8 Nut, Brass |
| | | 18698..... | Nut, 3/8" TUBE, W/Sleeve, HW |
| 3..... | 1 | 10330..... | Fitting, Sleeve, 3/8 Celcon |
| 4..... | 1 | 10332..... | Fitting, Insert, 3/8 |
| 5..... | 1 | 12747..... | Fitting, Flow Control |
| | | 60020-25..... | BLFC, 0.25 GPM, 1600 |
| | | 60020-50..... | BLFC, 0.50 GPM, 1600 |
| | | 60020-100..... | BLFC, 1.0 GPM, 1600 |
| 6..... | 1 | 12550-01..... | Quad Ring, -009, 560CD |
| 7..... | 1 | 12626-01..... | Seat, Brine Valve, 560CD |
| 8..... | 1 | 16958..... | Brine Valve Stem, 1600 Coated |
| 9..... | 1 | 11982-01..... | O-ring, -016, 560CD |
| 10..... | 3 | 15137..... | Screw, Hex Washer Mach, 10-24 x 3/8 |
| 11..... | 3 | 10269..... | Nut, Jam, 3/84 - 16 |
| 12..... | 3 | 16922..... | Bracket, Brine Valve Mounting |
| 13..... | 1 | 10250..... | Ring, Retaining |
| 14..... | 1 | 10249..... | Spring, Brine Valve |
| 15..... | 1 | 12748-01..... | Brine Valve Body, 1600 |
| 16..... | 2 | 10328..... | Fitting, Elbow, 90 Deg. |
| 17..... | | 60037-610..... | Brine Valve Assy. 9500/1600 0.25 GPM |
| | | 60037-620..... | Brine Valve Assy. 9500/1600 0.50 GPM |
| | | 60037-630..... | Brine Valve Assy. 9500/1600 1.0 GPM |
| | | 60037HW..... | Brine Valve Assy. 9500/1600 Hot Water |

1700 BRINE VALVE SYSTEM (FOR 9500)

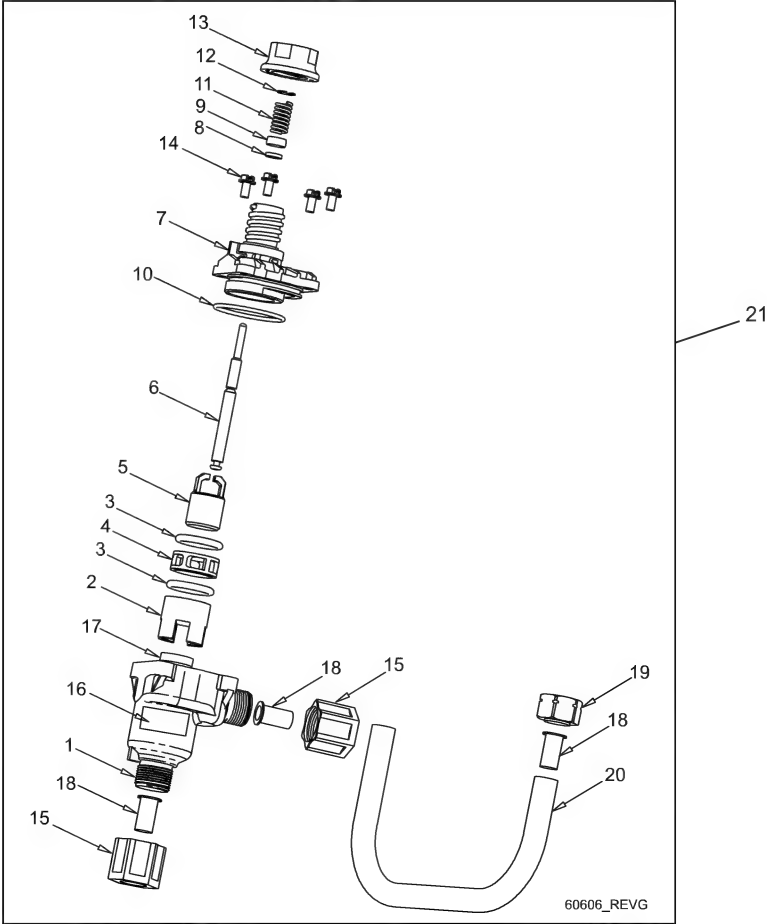


60039_REVA

| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|---|
| 1..... | 1 | 14792..... | Plug, End, Brine Valve |
| 2..... | 1 | 13201..... | Quad Ring, -020 |
| | | 13201-01..... | Quad Ring, -020, 560CD |
| 3..... | 1 | 12550..... | Quad Ring, -009 |
| | | 12550-01..... | Quad Ring, -009, 560CD |
| 4..... | 1 | 14785-01..... | Retainer, Flow Control |
| 5..... | 2 | 14811..... | O-ring, -210, 560CD, Brine |
| 6..... | 1 | 14795..... | Piston, Brine Valve |
| 7..... | 1 | 16929..... | Brine Valve Stem, Coated |
| 8..... | 1 | 15415..... | Fitting, Insert, 1/2" Tube |
| 9..... | 1 | 16124..... | Fitting, Sleeve, Delrin |
| 10..... | 1 | 16123..... | Nut, Brass |
| 11..... | 1 | 15137..... | Screw, Hex Washer Mach, 10-24 x 3/8 |
| 12..... | 1 | 10269..... | Nut, Jam, 3/4 - 16 |
| 13..... | 1 | 16922..... | Bracket, Brine Valve Mounting |
| 14..... | 2 | 10250..... | Ring, Retaining |
| 15..... | 1 | 15310..... | Spring, Brine Valve |
| 16..... | 2 | 14790..... | Brine Valve Body |
| 17..... | 1 | 14798..... | Spacer, 1700, Brine |
| 18..... | 1 | 15414..... | Nut, 2900, w/Sleeve |
| 19..... | 1 | 15413..... | Fitting, Elbow, Male, 1/2T x 3/8 NPT |
| 20..... | 1 | 16959..... | Tube, Brine 9500/1710, 10.6" |
| | | 16959-01..... | Tube, Brine Valve 9500/1710, CPVC, Hot Water |

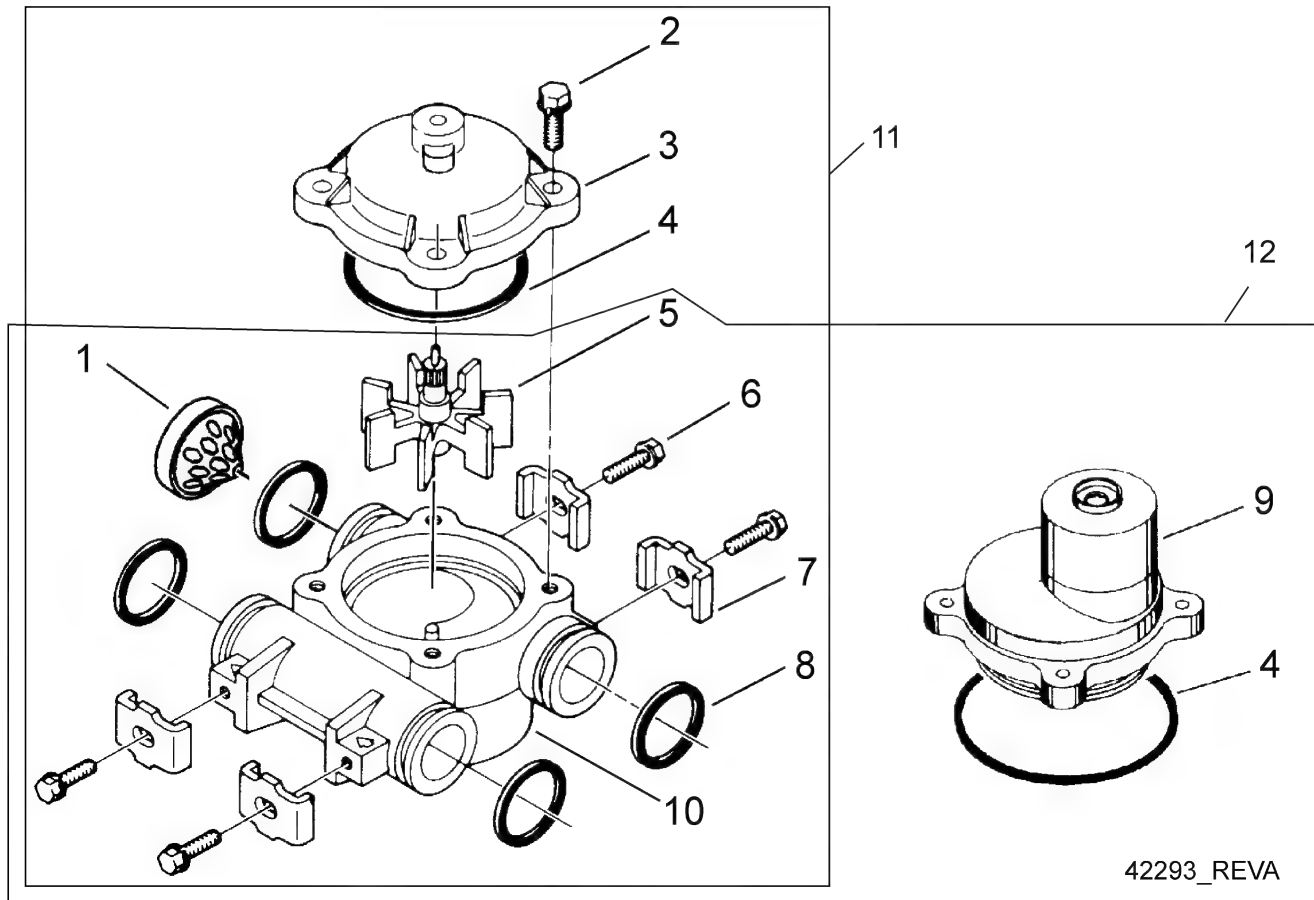
| Item No. | QTY | Part No. | Description |
|----------|-----|---------------|--|
| 21..... | | 60039-10..... | Brine Valve Assy. 9500/1700 1.0 GPM |
| | | 60039-12..... | Brine Valve Assy. 9500/1700 1.2 GPM |
| | | 60039-15..... | Brine Valve Assy. 9500/1700 1.5 GPM |
| | | 60039-20..... | Brine Valve Assy. 9500/1700 2.0 GPM |
| | | 60039-24..... | Brine Valve Assy. 9500/1700 2.4 GPM |
| | | 60039-30..... | Brine Valve Assy. 9500/1700 3.0 GPM |
| | | 60039-50..... | Brine Valve Assy. 9500/1700 5.0 GPM |
| | | 60039-00..... | Brine Valve Assy. 9500/1700 Blank |
| 22..... | | 12097..... | Washer, Flow, 1.0 GPM |
| | | 12085..... | Washer, Flow, 1.2 GPM |
| | | 19150..... | Washer, Flow, 1.3 GPM |
| | | 12086..... | Washer, Flow, 1.5 GPM |
| | | 19149..... | Washer, Flow, 1.7 GPM |
| | | 12087..... | Washer, Flow, 2.0 GPM |
| | | 12088..... | Washer, Flow, 2.4 GPM |
| | | 12089..... | Washer, Flow, 3.0 GPM |
| | | 12090..... | Washer, Flow, 3.5 GPM |
| | | 12091..... | Washer, Flow, 4.0 GPM |
| | | 19147..... | Washer, Flow, 4.5 GPM |
| | | 12092..... | Washer, Flow, 5.0 GPM |
| | | 17814..... | Washer, Flow, 6.0 GPM |
| | | 12408..... | Washer, Flow, 7.0 GPM |

1710 BRINE VALVE SYSTEM (FOR 9500)



| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-----|---------------|---------------------------------------|----------|-----|---------------|-------------------------------------|
| 1..... | 1 | 41202..... | Brine Valve, 1700, Plastic, Top | 21..... | 1 | 60606-10..... | Brine Valve Assy. 9500/1710 1.0 GPM |
| 2..... | 1 | 14785-01..... | Retainer, Flow Control | ..... | 1 | 60606-12..... | Brine Valve Assy. 9500/1710 1.2 GPM |
| 3..... | 2 | 14811..... | O-ring, -210, 560CD, Brine | ..... | 1 | 60606-15..... | Brine Valve Assy. 9500/1710 1.5 GPM |
| 4..... | 1 | 14798..... | Spacer, 1700, Brine | ..... | 1 | 60606-20..... | Brine Valve Assy. 9500/1710 2.0 GPM |
| 5..... | 1 | 14795..... | Piston, Brine Valve | ..... | 1 | 60606-24..... | Brine Valve Assy. 9500/1710 2.4 GPM |
| 6..... | 1 | 41429..... | Stem, Brine, 1710, Plastic, 9500 | ..... | 1 | 60606-30..... | Brine Valve Assy. 9500/1710 3.0 GPM |
| 7..... | 1 | 41201..... | Brine Valve, 1700, Plastic, Bottm | ..... | 1 | 60606-40..... | Brine Valve Assy. 9500/1710 4.0 GPM |
| 8..... | 1 | 12550..... | Ring, Quad, -009 | ..... | 1 | 60606-50..... | Brine Valve Assy. 9500/1710 5.0 GPM |
| 9..... | 1 | 17908..... | Sleeve, Brine Valve Stem | ..... | 1 | 60606-00..... | Brine Valve Assy. 9500/1710 Blank |
| 10..... | 1 | 41547..... | O-ring, 2mm x 35mm | | | | |
| 11..... | 1 | 15310..... | Spring, Brine Valve | | | | |
| 12..... | 1 | 10250..... | Ring, Retaining | | | | |
| 13..... | 1 | 17906-01..... | Guide, Brine Valve Stem | | | | |
| 14..... | 4 | 14202-01..... | Screw, Hex Washer, Mach, 8-32 x 5/16" | | | | |
| 15..... | 2 | 41056..... | Nut Assy, 1/2" Plastic | | | | |
| 16..... | 1 | 41493-XX..... | Label, BLFC, 1710 (Specify GPM) | | | | |
| 17..... | 1 | | Washer, Flow (Specify GPM) | | | | |
| 18..... | 3 | 15415..... | Fitting, Insert, 1/2", Tube | | | | |
| 19..... | 1 | 15414..... | Nut, 2900, w/Sleeve | | | | |
| 20..... | 1 | 16959..... | Tube, Brine 9500/1700, 10.6" | | | | |

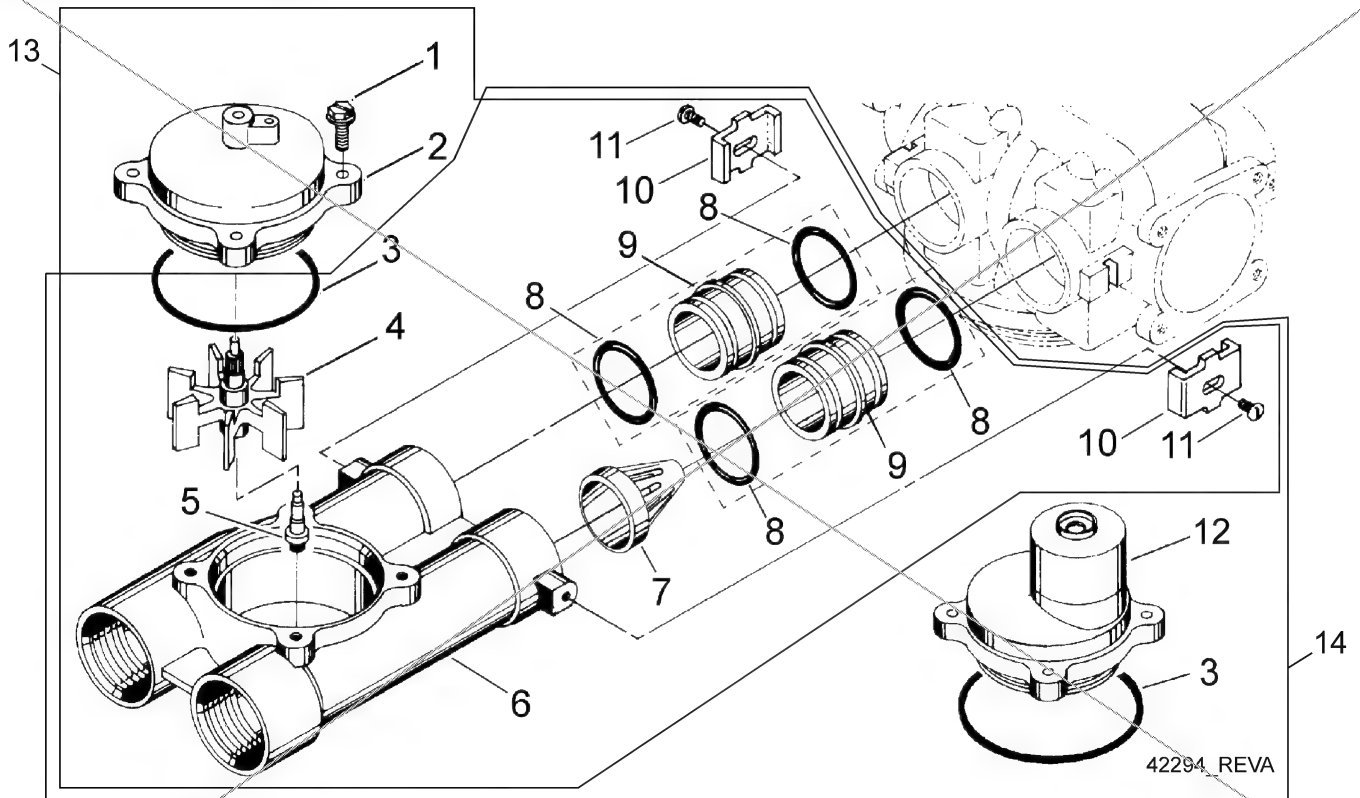
3/4" METER ASSEMBLY



42293_REVA

| Item No. | QTY | Part No. | Description |
|----------|---------|-------------|---|
| 1..... | 1 | 14613..... | Flow Straightener |
| 2..... | 4 | 12473..... | Screw, Hex Washer, 10-24 x 5/8 |
| 3..... | 1 | 14038..... | Meter Cap Assy, STD, Plastic |
| 4..... | 1 | 13847 | O-ring, -137, Std/560CD, Meter |
| 5..... | 1 | 13509..... | Impeller, Meter |
| 6..... | 4 | 13314..... | Screw, Slot Ind Hex, 8-18 x .60 |
| 7..... | 4 | 13255..... | Clip, Mounting |
| 8..... | 4 | 13305..... | O-ring, -119 |
| 9..... | 1 | 15150..... | Meter Cap Assy, EXT, Plastic Paddle |
| 10..... | 1 | 13821..... | Body, Meter, 5600 |
| 11..... | 1 | 60086..... | Meter Assy, 3/4" Dual Port, Slip, STD, Plastic, Paddlewheel, w/ Clips |
| 12..... | 1 | 60087 | Meter Assy, 3/4" Dual Port, Slip, EXT, Plastic, Paddlewheel, w/ Clips |

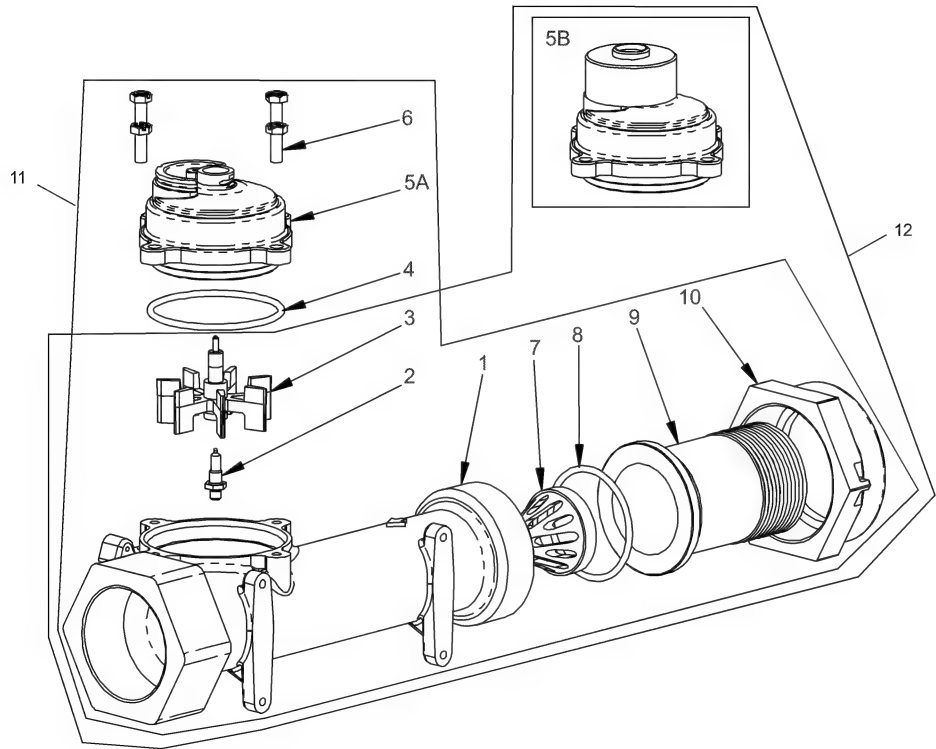
1" METER ASSEMBLY



| Item No. | QTY | Part No. | Description |
|----------|--------|----------------|---|
| 1..... | 4..... | 12112..... | Screw, Hex Hd Mach 10-24 x 1/2 |
| 2..... | 1..... | 15218..... | Meter Cap Assy, Brass, Standard |
| | | 14038..... | Meter Cap Assy, Standard |
| 3..... | 1..... | 13847..... | O-ring, -137, STD/560CD, Meter |
| 4..... | 1..... | 13509..... | Impeller, Meter |
| | | 13509-01..... | Impeller, Celcon |
| 5..... | 1..... | 13882..... | Post, Meter Impeller |
| 6..... | 1..... | 15043..... | Body, Meter, 9000 1" |
| 7..... | 1..... | 14960..... | Flow Straightener, 1" |
| 8..... | 4..... | 13305..... | O-ring, -119 |
| 9..... | 2..... | 15078..... | Adapter, 1" Coupling |
| 10..... | 2..... | 13255..... | Clip, Mounting |
| 11..... | 2..... | 14202-01..... | Screw, Hex Washer Mach, 8-32 x 5/16 |
| 12..... | 1..... | 15150..... | Meter Cap Assy, Ext, Plastic Paddle |
| | | 15237..... | Meter Cap Assy, Ext, Brass Paddle |
| 13..... | | 60390..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS BDY, PDL, W/CLPS |
| | | 60390-001..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS BDY, 560CD, PDL, W/CLPS |
| | | 60390NP..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS BDY, NP, PDL, W/CLPS |
| | | 60632..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS, HW, PDL |
| | | 60632NP..... | Meter Assy, 1" Dual Port, NPT, EXT, BRS, HW, NP, PDL |
| | | 60389..... | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, PDL, W/CLPS |

| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|---|
| | | 60389-001..... | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, 560CD, PDL, W/CLPS |
| | | 60389-001NP.... | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, 560CD, PDL, W/CLPS |
| | | 60389NP..... | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, NP, PDL, W/CLPS |
| | | 60612..... | Meter Assy, 1" Dual Port, NPT, STD, BRS, HW, PDL |
| | | 60612NP..... | Meter Assy, 1" Dual Port, NPT, STD, BRS, HW, NP, PDL |
| | | 61575..... | Meter Assy, 1" Dual Port, NPT, STD, BRS BDY, PDL, W/O CLP & SCW |
| | | 60389-20..... | Meter Assy, 1" Dual Port, BSP/Metric, STD, BRS BDY, PDL, W/CLPS |
| | | 60390-20..... | Meter Assy, 1" Dual Port, BSP/Metric, EXT, BRS BDY, PDL, W/CLPS |
| | | 60632-20..... | Meter Assy, 1" Dual Port, BSP/Metric, EXT, BRS, HW, PDL |
| | | 60612-20..... | Meter Assy, 1" Dual Port, BSP/Metric, STD, BRS, HW, PDL |

1-1/2" METER ASSEMBLY



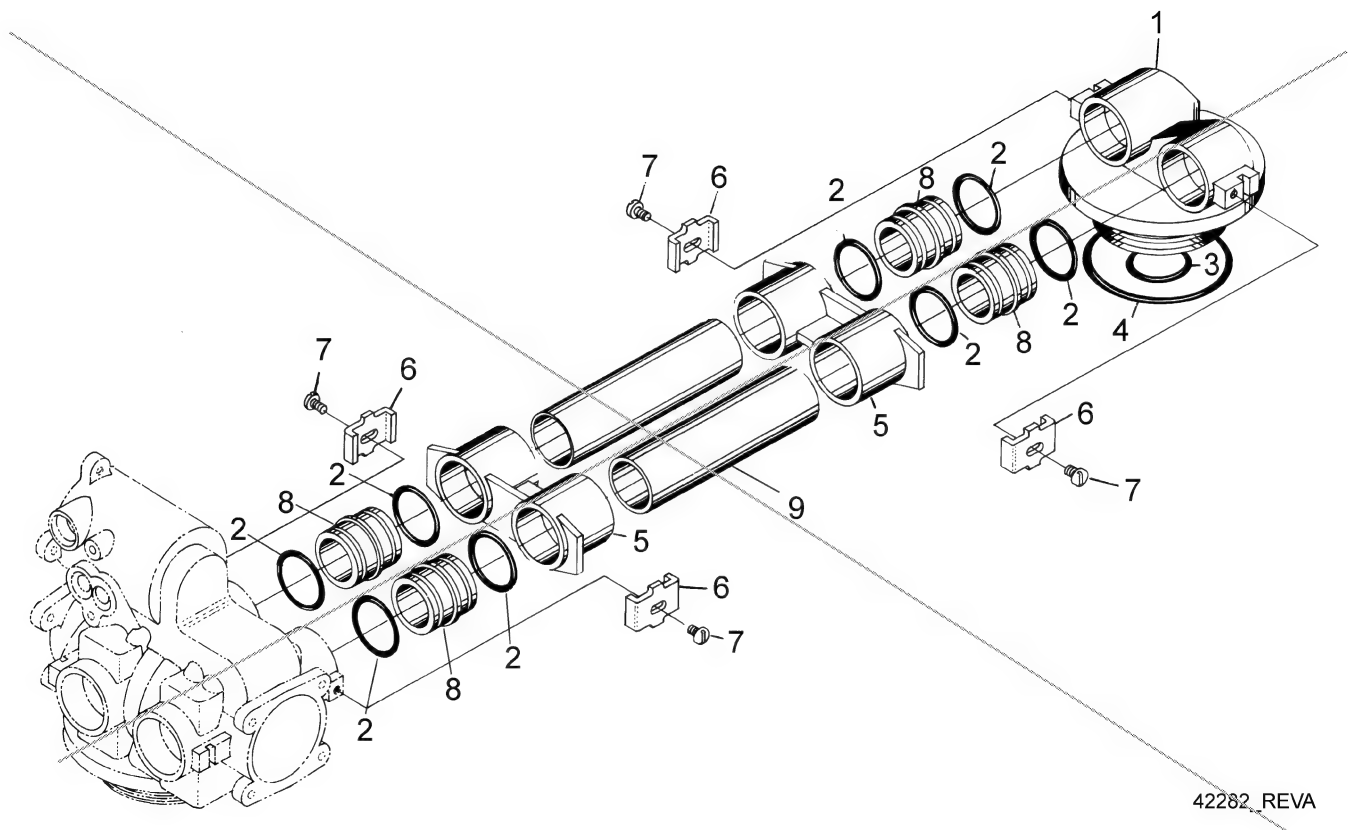
60610 Rev C

| Item No. | QTY | Part No. | Description |
|----------|---------|---------------|--|
| 1..... | 1 | 17569..... | Body, Meter, 2850/9500 |
| 2..... | 1 | 13882..... | Post, Meter Impeller |
| 3..... | 1 | 13509..... | Impeller, Meter |
| | 1 | 13509-01..... | Impeller, Celcon, Hot Water |
| 4..... | 1 | 13847 | O-Ring, -137, Std/560CD, Meter |
| 5A | 1 | 14038..... | Meter Cap Assy, STD Range, Plastic |
| 5B | 1 | 15150..... | Meter Cap Assy, Ext Range, Plastic |
| 6..... | 4 | 12112..... | Screw, Hex Hd Mach, 10-24 x 1/2 18-8 Stainless Steel |
| 7..... | 1 | 17542..... | Flow Straightener, 1-1/2" |
| 8..... | 1 | 12733..... | O-Ring, -132 |
| 9..... | 1 | 17544 | Fitting, 1-1/2" Quick Connector |
| 10..... | 1 | 17543..... | Nut, 1-1/2", Q/C |
| 11 | | 60610-01..... | Meter Assy, 1-1/2", NPT, STD, Brass, Paddlewheel |
| | | 60610-21..... | Meter Assy, 1-1/2", BSP, STD, Brass, Paddlewheel |
| 12..... | | 60610-02..... | Meter Assy, 1-1/2", NPT, STD, Brass Paddlewheel |
| | | 60610-22..... | Meter Assy, 1-1/2", BSP, EXT, Brass, Paddlewheel |

Not Shown

| | | |
|---------|------------|---|
| 1 | 17790..... | Sleeve, Meter, 1 1/2" x 1" |
| 1 | 15218..... | Meter Cap Assy, STD Range, Brass, Hot Water |
| 1 | 15237..... | Meter Cap Assy, EXT Range, Brass, Hot Water |
| | | Sleeve, Meter, 1.5" x 1" |

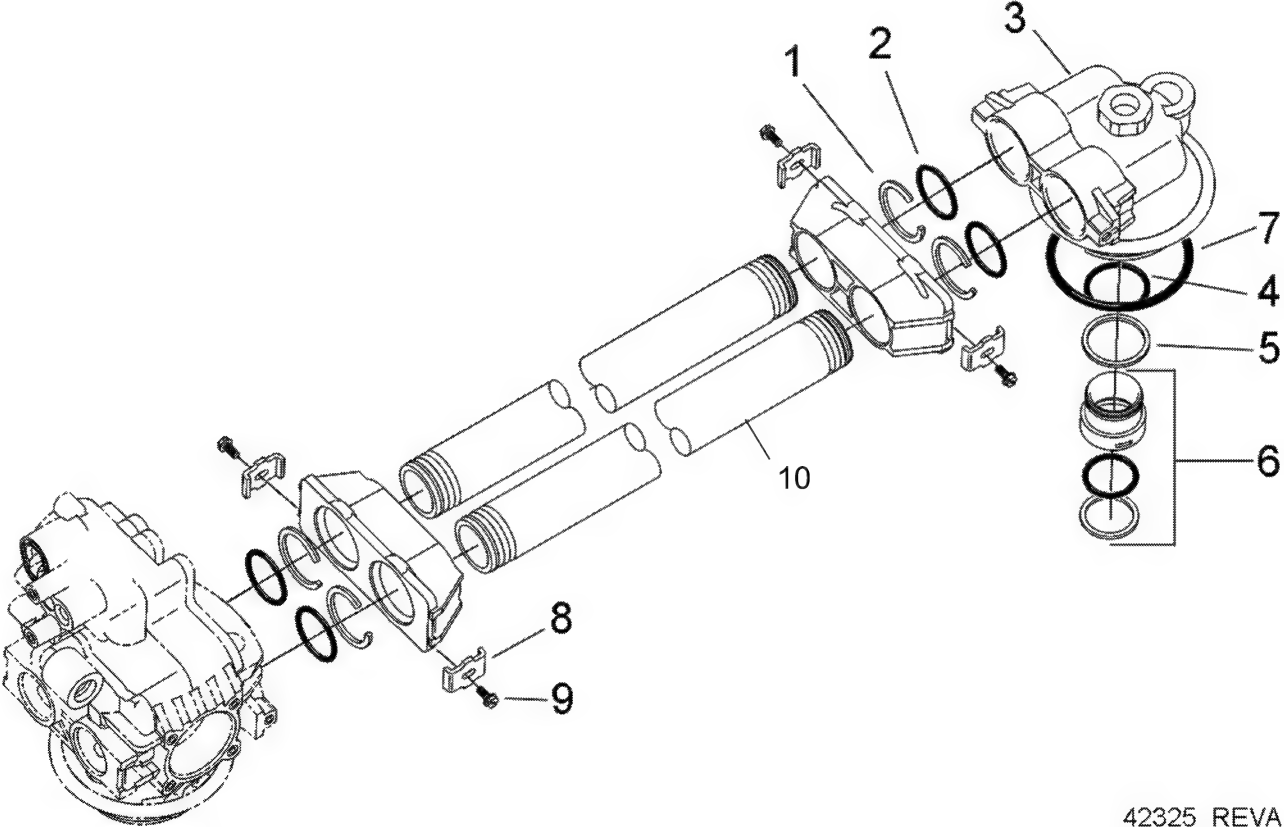
9000 SECOND TANK ASSEMBLY



42282_REVA

| Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|---|
| 1..... | 1 | 14864-01..... | Adapter, 9000, 2nd Tank, Machd w/O-rings |
| 2..... | 8 | 13305..... | O-ring, -119 |
| 3..... | 1 | 11710..... | O-ring, -215 |
| 4..... | 1 | 12281..... | O-ring, -338 |
| 5..... | 2 | 13708-40..... | Yoke, 1" Sweat |
| ..... | 1 | 15823-XX..... | Yoke Assy. Specify Tank Size |
| 6..... | 4 | 13255..... | Clip, Mounting |
| 7..... | 4 | 14202-01..... | Screw, Hex Washer Mach, 8-32 x 5/16 |
| 8..... | 4 | 15078..... | Adapter, 1" Coupling |
| 9..... | | 15823-06..... | 9000 Tube Assy, 6" Dia. Tank Only (Overall Length 7.25) |
| ..... |  | 15823-06NP..... | 9000 Tube Assy, 6" Dia. Tank Only (Overall Length 7.25) |
| ..... |  | 15823-12..... | 9000 Tube Assy, 6" to 12" Dia. Tank (Overall Length 9.75) |
| ..... |  | 15823-12NP..... | 9000 Tube Assy, 6" to 12" Dia. Tank (Overall Length 9.75) |
| ..... |  | 15823-14..... | 9000 Tube Assy, 14" Dia. Tank (Overall Length 11.75) |
| ..... |  | 15823-14NP..... | 9000 Tube Assy, 14" Dia. Tank (Overall Length 11.75) |
| ..... |  | 15823-16..... | 9000 Tube Assy, 16" Dia. Tank (Overall Length 13.75) |
| ..... |  | 15823-16NP..... | 9000 Tube Assy, 16" Dia. Tank (Overall Length 13.75) |

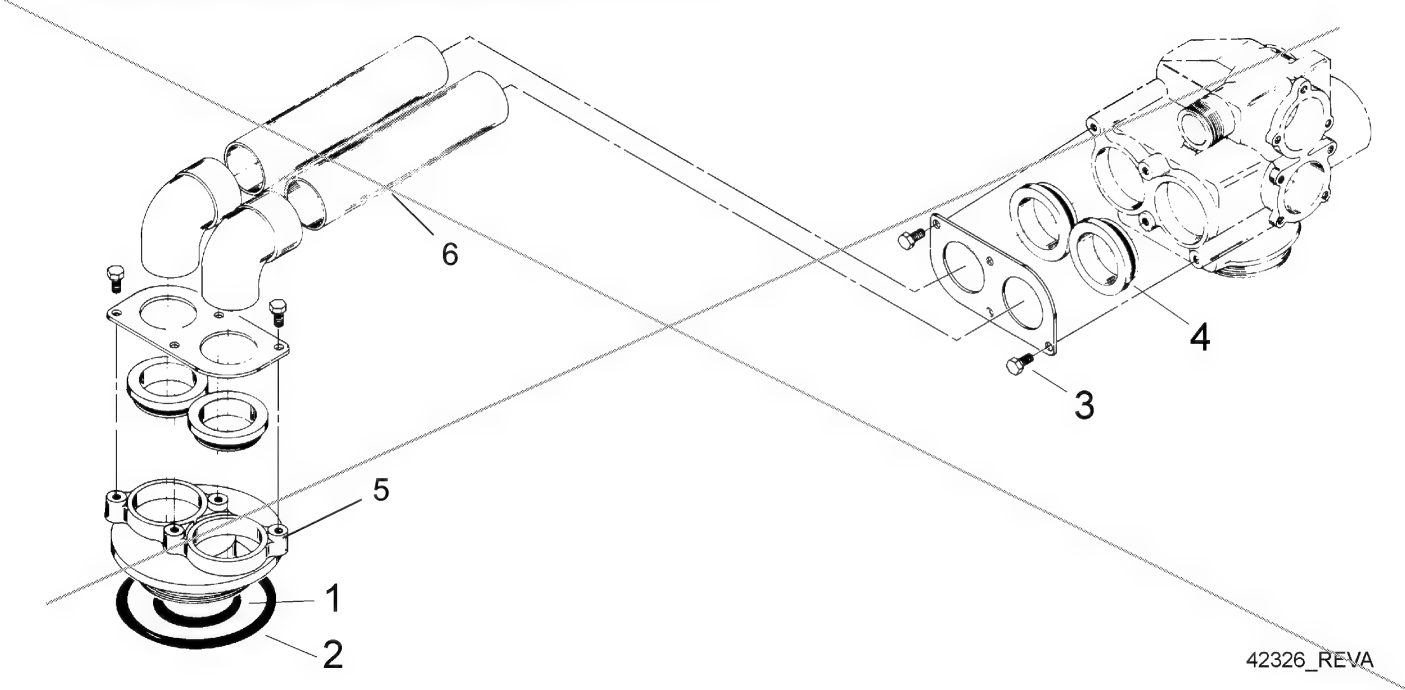
9100 SECOND TANK ASSEMBLY



42325_REVA

| Item No. | QTY | Part No. | Description |
|----------|---------|---------------------|-------------------------------------|
| 1..... | 4 | 40678..... | Ring, 9100, Yoke Retainer |
| 2..... | 4 | 13287..... | O-ring, -123 |
| 3..... | 1 | 14865..... | Adapter Assy, 2nd Tank, 9100 |
| 4..... | 1 | 19054..... | O-ring, -124 |
| 5..... | 1 | 40538..... | Retainer, 32mm, O-ring Dist, 7000 |
| 6..... | 1 | 61419..... | Kit, 1.05" Distributor, Adapter |
| 7..... | 1 | 18303..... | O-ring, -336 |
| 8..... | 4 | 13255..... | Clip, Mounting |
| 9..... | 4 | 14202-01..... | Screw, Hex Washer Mach, 8-32 x 5/16 |
| 10..... | | 60425-9..... | Tube Assy, 9100 8-9" Tank |
| | | 60425-12..... | Tube Assy, 9100 6-12" Tank |
| | | 60425-16..... | Tube Assy, 9100 13-16" Tank |

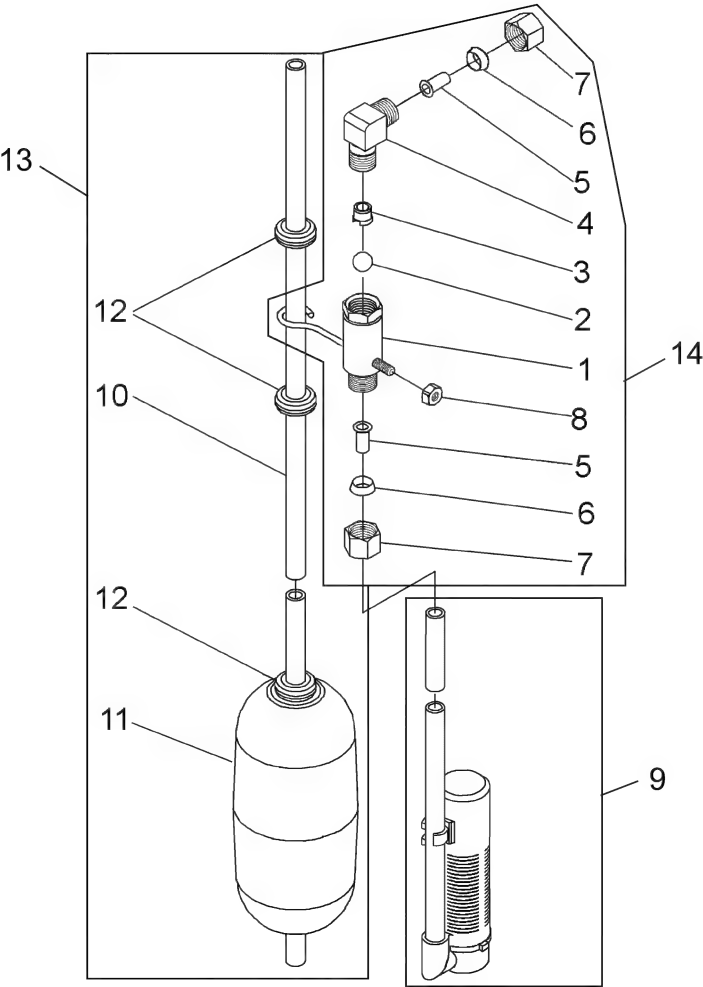
9500 SECOND TANK ASSEMBLY



42326_REVA

| Item No. | QTY | Part No. | Description |
|----------|---------|-----------------------|---|
| 1..... | 1 | 13577 | O-ring, -226 |
| 2..... | 1 | 16455 | O-ring, -347 |
| 3..... | 8 | 10231 | Screw, Slot Hex, 1/4 - 20 x 1/2 |
| 4..... | 4 | 17224 | O-ring, -224 |
| 5..... | 1 | 16916-01..... | Adapter, 9500, 2nd Tank, NPT |
| | | 16916-21..... | Adapter, 9500, 2nd Tank, Metric |
| | | 16916-01NP..... | Adapter, 9500, 2nd Tank, NPT, Nickel Plated |
| 6..... | | 17465-16..... | Tube Assy, 2nd Tank, 16" 9500 |
| | | 17465-16NP..... | Tube Assy, 2nd Tank, 16" 9500 Nickel Plated |
| | | 17465-20..... | Tube Assy, 2nd Tank, 20" 9500 |
| | | 17465-24..... | Tube Assy, 2nd Tank, 24" 9500 |
| | | 17465-24NP..... | Tube Assy, 2nd Tank, 24" 9500 Nickel Plated |

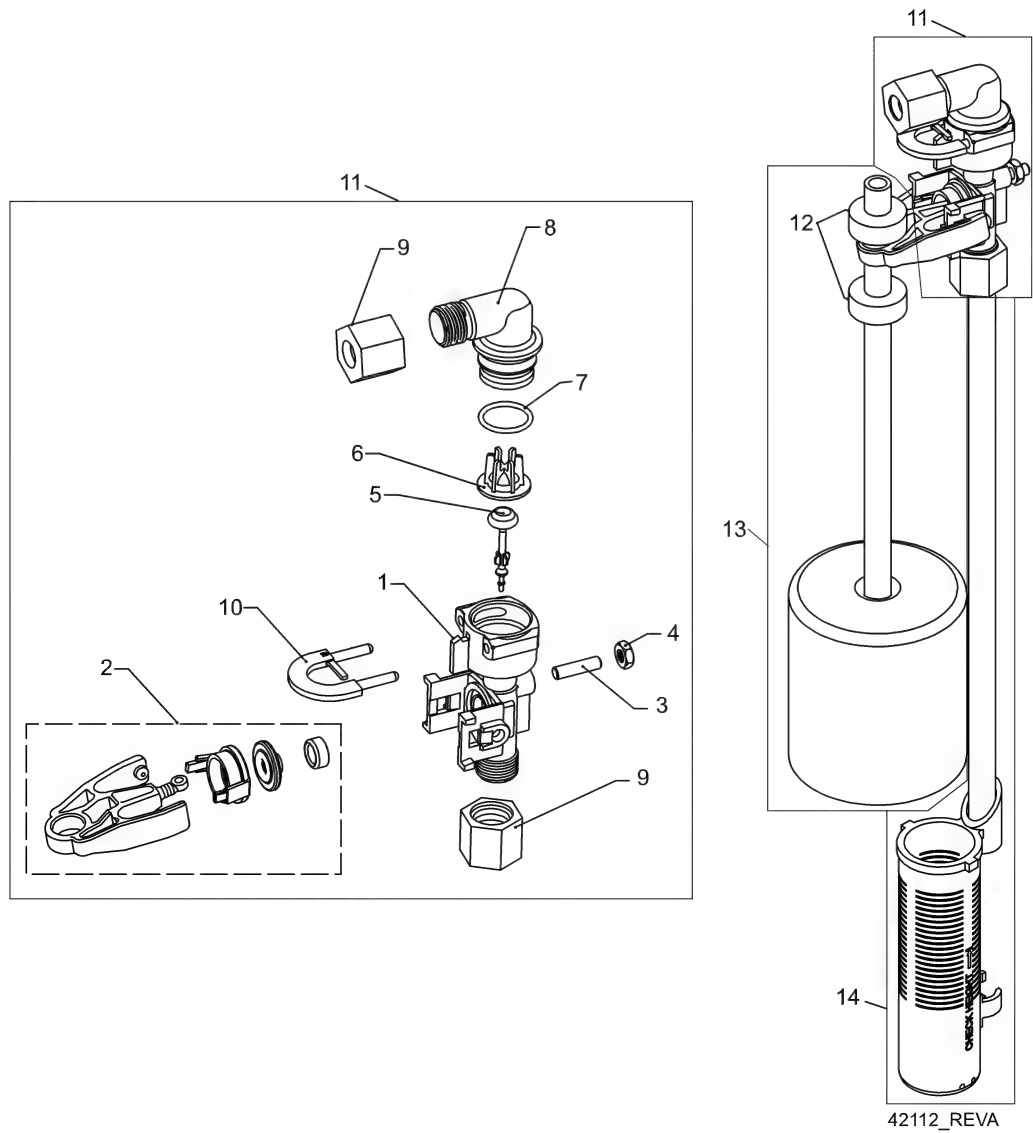
2300 SAFETY BRINE VALVE



60027 Rev D

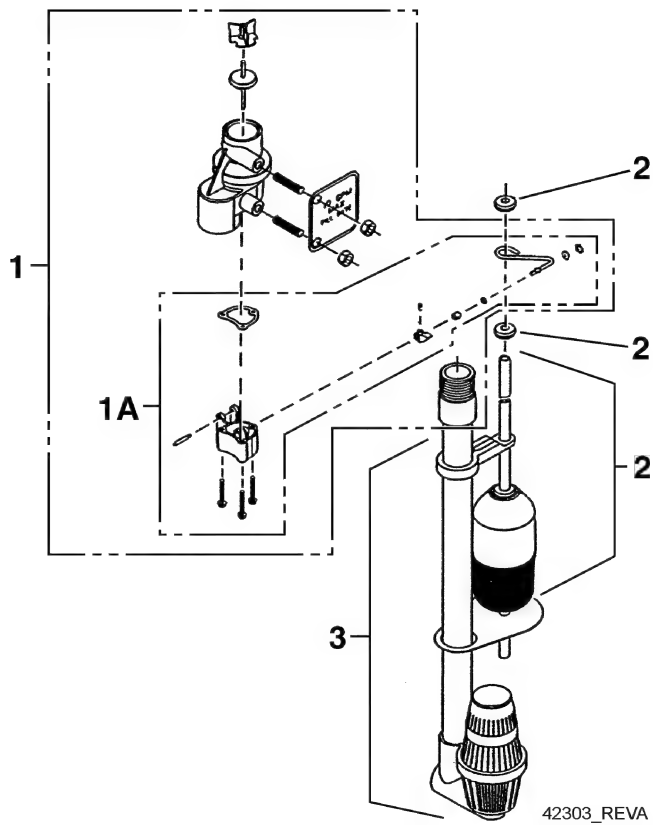
| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-------|------------------|--|----------|-------|----------------|--|
| 1.....1 | | 60027-00..... | Safety Brine Valve, 2300, Less Elbow | 11.....1 | ..... | 10700..... | Float Assy, White |
| 2.....1 | | 10138..... | Ball, 3/8", Brass | 12.....3 | ..... | 10150..... | Grommet, .30 Dia |
| 3.....1 | | 11566..... | Ball Stop, Slow Fill | 13.....1 | ..... | 60028-30..... | Float Assy, 2300, 30" White |
| 4.....1 | | 10328..... | Fitting, Elbow, 90 Deg. 1/4 NPT x 3/8 Tube | 14.....1 | ..... | 60027-FFA..... | Safety Brine Valve, 2300, Fitting Facing Arm |
| 5.....1 | | 10332..... | Fitting, Insert, 3/8 | 1..... | ..... | 60027-FFS..... | Safety Brine Valve, 2300 Fitting Facing Stud |
| 6.....1 | | 10330..... | Fitting, Sleeve, 3/8 Celcon | | | | |
| 7.....1 | | 10329..... | Fitting, Tube, 3/8 Nut, Brass | | | | |
| 8.....1 | | 10186..... | Nut, Hex, 10-32 | | | | |
| 9.....1 | | 60002-10..... | Air Check, #500, American Hydro | | | | |
| | | 60002-11.38..... | Air Check, #500, 11.38" Long | | | | |
| | | 60002-24..... | Air Check, #500, 24" Long | | | | |
| | | 60002-27..... | Air Check, #500, 27" Long | | | | |
| | | 60002-32..... | Air Check, #500, 32" Long | | | | |
| | | 60002-34..... | Air Check, #500, 34" Long | | | | |
| | | 60002-36..... | Air Check, #500, 36" Long | | | | |
| | | 60002-48..... | Air Check, #500, 48" Long | | | | |
| | | 60002-26.25..... | Air Check, #500, 26.25" Long | | | | |
| | | 60002-33.25..... | Air Check, #500, 33.25" Long | | | | |
| 10.....1 | | 10149..... | Rod, Float, 30" | | | | |

2310 SAFETY BRINE VALVE



| Item No. | QTY | Part No. | Description | Item No. | QTY | Part No. | Description |
|----------|-----|-----------------|----------------------------------|----------|-----|------------------|---------------------------------|
| 1..... | 1 | 19645..... | Body, Safety Brine Valve, 2310 | 14..... | 1 | 60002-10..... | Air Check, #500, American Hydro |
| 2..... | 1 | 19803..... | Safety Brine Valve Assy | ..... |  | 60002-11.38..... | Air Check, #500, 11.38" Long |
| 3..... | 1 | 19804..... | Screw, Sckt Hd, Set, 10-24 x .75 | ..... |  | 60002-24..... | Air Check, #500, 24" Long |
| 4..... | 1 | 19805..... | Nut, Hex, 10-24, Nylon Black | ..... |  | 60002-27..... | Air Check, #500, 27" Long |
| 5..... | 1 | 19652-01..... | Poppet Assy, SBV w/O-ring | ..... |  | 60002-32..... | Air Check, #500, 32" Long |
| 6..... | 1 | 19649..... | Flow Dispenser | ..... |  | 60002-34..... | Air Check, #500, 34" Long |
| 7..... | 1 | 11183..... | O-ring, -017 | ..... |  | 60002-36..... | Air Check, #500, 36" Long |
| 8..... | 1 | 19647..... | Elbow, Safety Brine Valve | ..... |  | 60002-48..... | Air Check, #500, 48" Long |
| 9..... | 2 | 19625..... | Nut Assy, 3/8" Plastic | ..... |  | 60002-26.25..... | Air Check, #500, 26.25" Long |
| 10..... | 1 | 18312..... | Retainer, Drain | ..... |  | 60002-33.25..... | Air Check, #500, 33.25" Long |
| 11..... | 1 | 60014..... | Safety Brine Valve Assy, 2310 | | | | |
| 12..... | 2 | 10150..... | Grommet, .30 Dia | | | | |
| 13..... | 1 | 60068-8.06..... | Float Assy, 2310, w/8.06" Rod | | | | |
| | | 60068-10.5..... | Float Assy, 2310, w/10.5" Rod | | | | |
| | | 60068-11.5..... | Float Assy, 2310, w/11.5" Rod | | | | |
| | | 60068-20..... | Float Assy, 2310, w/20" Rod | | | | |
| | | 60068-30..... | Float Assy, 2310, w/30" Rod | | | | |

2350 SAFETY BRINE VALVE

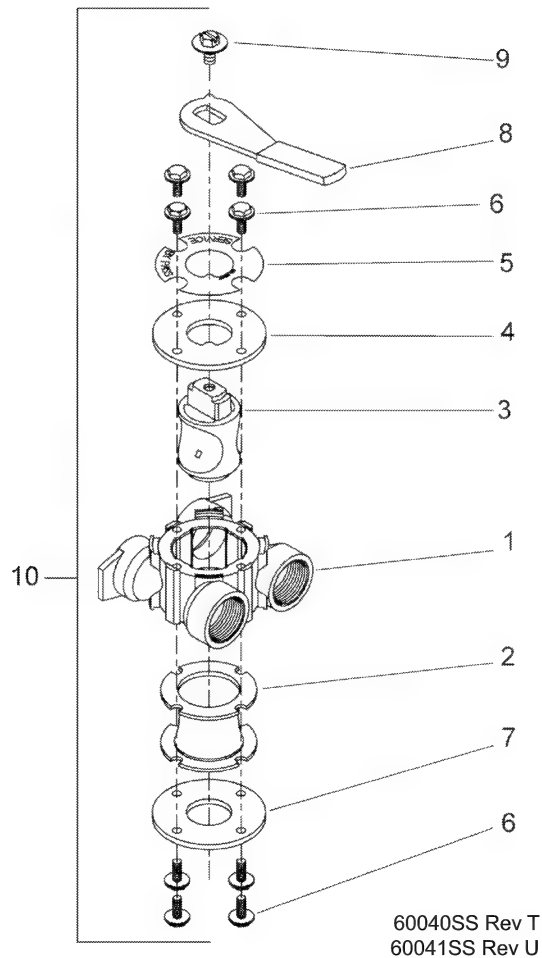


| Item No. | QTY | Part No. | Description |
|----------|---------|-----------------|---|
| 1..... | 1 | 60038 | Safety Brine Valve, 2350 |
| 1A | 1 | 61024 | Actuator Assy, 2350 Brine |
| 2..... | 1 | 60028-30..... | Float Assy, 2350, 30" Wht |
| ..... | 1 | 60026-30SAN ... | Float Assy, 2350, 30" Hot Water |
| 3..... | 1 | 60009-00..... | Air Check, #900, Commercial Less Fittings |
| ..... | 1 | 60009-01..... | Air Check, #900, Commercial, Hot Water Less Fittings |

Not Shown

| | | | |
|-------|---------|-------------|----------------------------------|
| ..... | 1 | 18603 | Fitting Assy, 900 Air Check 2350 |
| ..... | 1 | 18602..... | Fitting Assy, 900 Air Check |

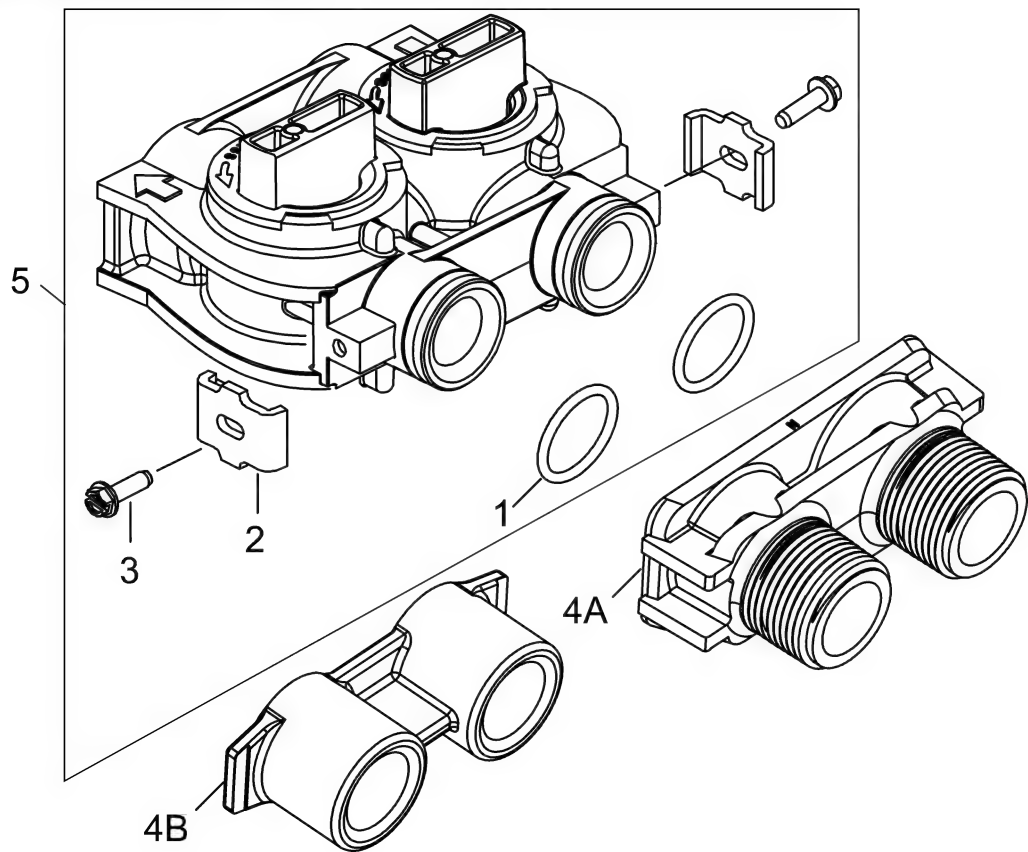
BYPASS VALVE ASSEMBLY (METAL)



| Item No. | QTY | Part No. | Description |
|----------|---------|---------------|--|
| 1..... | 1 | 40614..... | Bypass Body, 3/4" |
| | | 40634..... | Bypass Body, 1", SS |
| 2..... | 1 | 14105..... | Seal, Bypass, 560CD |
| 3..... | 1 | 11972..... | Plug, Bypass |
| 4..... | 1 | 11978..... | Side Cover |
| 5..... | 1 | 13604-01..... | Label |
| 6..... | 8 | 15727..... | Screw, 10-24 x 0.5" |
| 7..... | 1 | 11986..... | Side Cover |
| 8..... | 1 | 11979..... | Lever, Bypass |
| 9..... | 1 | 11989..... | Screw, Hex Head, 1/4-14 x 1.5" |
| 10..... | 1 | 60040SS..... | Bypass Valve, 5600, 3/4" NPT Blk Grip Lever, SS |
| | | 60041SS..... | Bypass Valve, 5600, 1" NPT Blk Grip Lever, SS |
| * | 2 | 19228-01..... | Adapter Assy, Coupling, w/O-rings |

*Not Shown

BYPASS VALVE ASSEMBLY (PLASTIC)



60049 Rev G

| Item No. | QTY | Part No. | Description |
|----------|--------|---------------------|---|
| 1.....2 | ..... | 13305..... | O-ring, -119 |
| 2.....2 | ..... | 13255..... | Clip, Mounting |
| 3.....2 | ..... | 13314..... | Screw, Slot Ind Hex, 8-18 x .60 |
| 4A.....1 | ..... | 18706..... | Yoke, 1", NPT, Plastic |
| | | 18706-02..... | Yoke, 3/4", NPT, Plastic |
| 4B.....1 | ..... | 13708-40..... | Yoke, 1", Sweat |
| | | 13708-45..... | Yoke, 3/4", Sweat |
| | | 19275..... | Yoke, Angle 90 Deg, 3/4", NPT |
| | | 19275-45..... | Yoke, Angle 90 Deg, 3/4" Sweat |
| | | 19620-01..... | Yoke Assy, 3/4", R/Angle, 90 Deg w/O-rings, Clips & Screws |
| | | 40636..... | Yoke, 1 1/4", NPT |
| | | 40636-49..... | Yoke, 1 1/4", Sweat |
| | | 41027-01..... | Yoke, 3/4", NPT, Cast, Machined |
| | | 41026-01..... | Yoke, 1", NPT, Cast, Machined, SS |
| | | 41026-02..... | Yoke, 1", BSP, Cast, MACHD, SS |
| | | 18706-10..... | Yoke, 1", BSP, Plastic |
| | | 41027-02..... | Yoke, 3/4", BSP, Cast, MACHD |
| | | 18706-12..... | Yoke, 3/4", BSP, Plastic |
| | | 19620-01..... | Yoke Assy, 3/4", R/Angle, 90 Deg |
| 5.....1 | ..... | 60049..... | Bypass Plastic |
| * |2 | 19228-01..... | Adapter Assy, Coupling, w/O-rings |

*Not Shown

GENERAL SERVICE HINTS FOR METER CONTROL

Problem: Softener delivers hard water

Reason: Reserve capacity has been exceeded.

Correction: Check salt dosage requirements and reset program wheel to provide additional reserve.

Reason: Program wheel is not rotating with meter output.

Correction: Pull cable out of meter cover and rotate manually. Program wheel must move without binding and clutch must give positive clicks when program wheel strikes regeneration stop. If it does not, replace timer.

Reason: Meter is not measuring flow.

Correction: Check meter with meter checker.

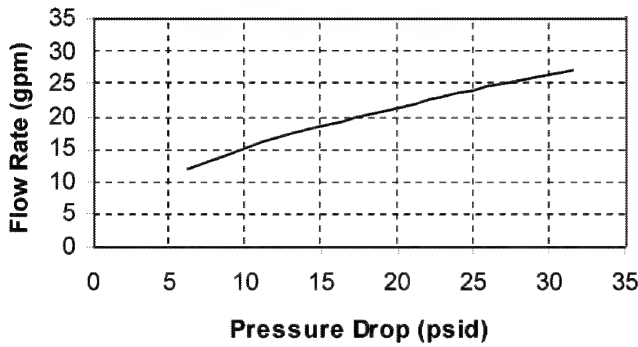
TROUBLESHOOTING

| Problem | Cause | Correction |
|--|--|---|
| Water conditioner fails to regenerate. | Electrical service to unit has been interrupted | Assure permanent electrical service (check fuse, plug, pull chain, or switch) |
| | Timer is defective. | Replace timer. |
| | Power failure. | Reset time of day. |
| Hard water. | By-pass valve is open. | Close by-pass valve. |
| | No salt is in brine tank. | Add salt to brine tank and maintain salt level above water level. |
| | Injector screen plugged. | Clean injector screen. |
| | Insufficient water flowing into brine tank. | Check brine tank fill time and clean brine line flow control if plugged. |
| | Hot water tank hardness. | Repeated flushings of the hot water tank is required. |
| | Leak at distributor tube. | Make sure distributor tube is not cracked. Check O-ring and tube pilot. |
| | Internal valve leak. | Replace seals and spacers and/or piston. |
| Unit used too much salt. | Improper salt setting. | Check salt usage and salt setting. |
| | Excessive water in brine tank. | See "Excessive water in brine tank". |
| Loss of water pressure. | Iron buildup in line to water conditioner. | Clean line to water conditioner. |
| | Iron buildup in water conditioner. | Clean control and add mineral cleaner to mineral bed. Increase frequency of regeneration. |
| | Inlet of control plugged due to foreign material broken loose from pipes by recent work done on plumbing system. | Remove piston and clean control. |
| Loss of mineral through drain line. | Air in water system. | Assure that well system has proper air eliminator control. Check for dry well condition. |
| | Improperly sized drain line flow control. | Check for proper drain rate. |
| Iron in conditioned water. | Fouled mineral bed. | Check backwash, brine draw, and brine tank fill. Increase frequency of regeneration. Increase backwash time. |
| Excessive water in brine tank. | Plugged drain line flow control. | Clean flow control. |
| | Plugged injector system. | Clean injector and screen. |
| | Timer not cycling. | Replace timer. |
| | Foreign material in brine valve. | Replace brine valve seat and clean valve. |
| | Foreign material in brine line flow control. | Clean brine line flow control. |
| Softener fails to draw brine. | Drain line flow control is plugged. | Clean drain line flow control. |
| | Injector is plugged. | Clean injector |
| | Injector screen plugged. | Clean screen. |
| | Line pressure is too low. | Increase line pressure to 20 psi |
| | Internal control leak | Change seals, spacers, and piston assembly. |
| | Service adapter did not cycle. | Check drive motor and switches. |
| Control cycles continuously. | Misadjusted, broken, or shorted switch. | Determine if switch or timer is faulty and replace it, or replace complete power head. |
| Drain flows continuously. | Valve is not programming correctly. | Check timer program and positioning of control. Replace power head assembly if not positioning properly. |
| | Foreign material in control. | Remove power head assembly and inspect bore. Remove foreign material and check control in various regeneration positions. |
| | Internal control leak. | Replace seals and piston assembly. |

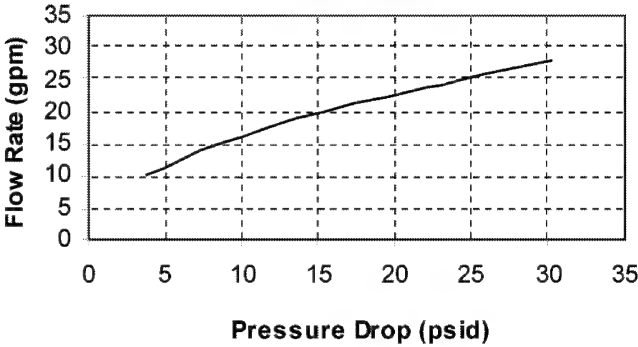
9000/9100/9500 METER FLOW DATA

9000 Meter Flow Data

3/4" Mechanical Meter



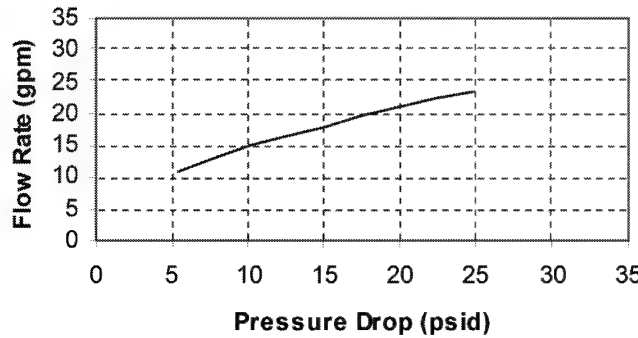
1" Brass Meter



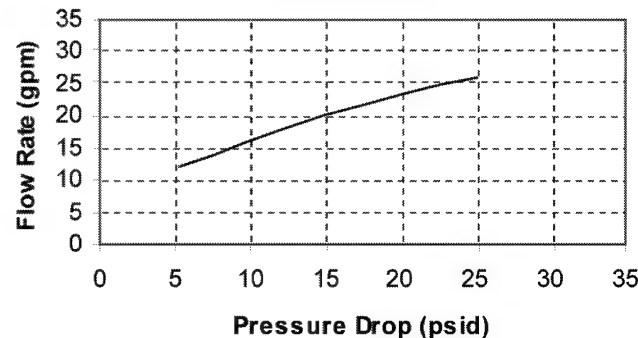
TR: 18467
41092

9100 Meter Flow Data

3/4" Mechanical Meter



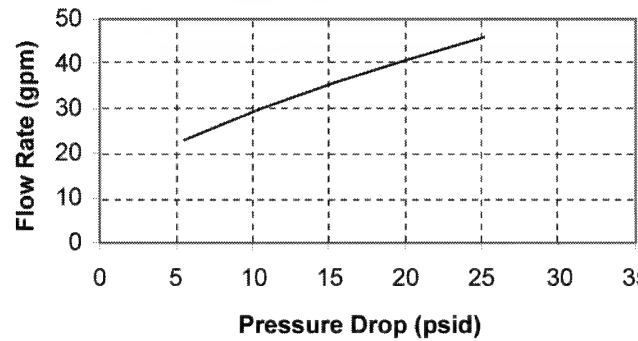
1" Brass Meter



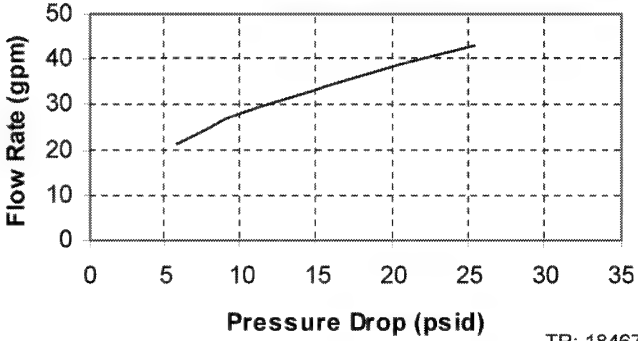
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9500 Meter Flow Data

1 1/2" Meter

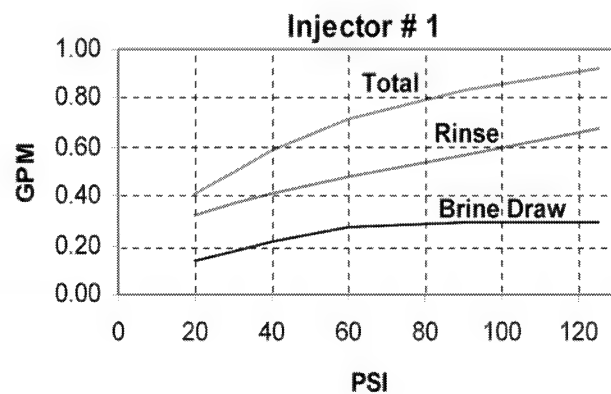
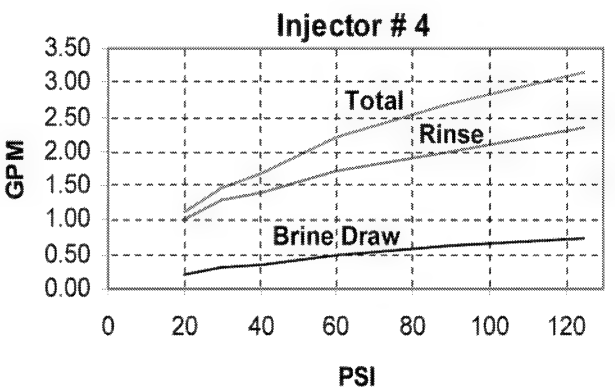
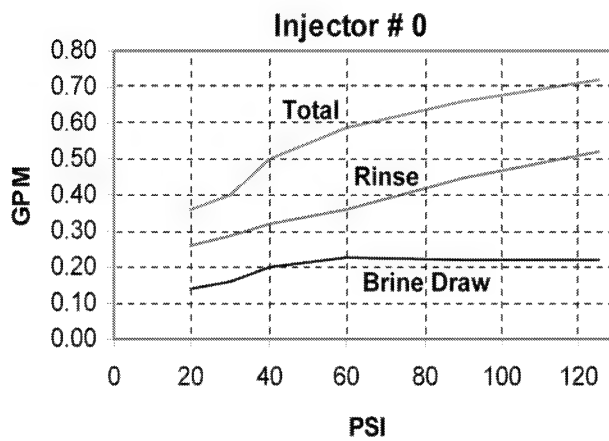
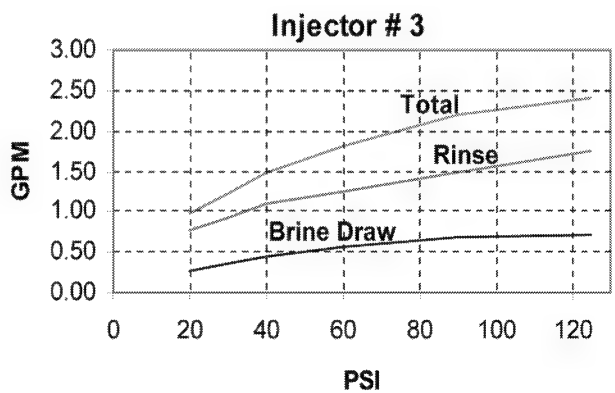
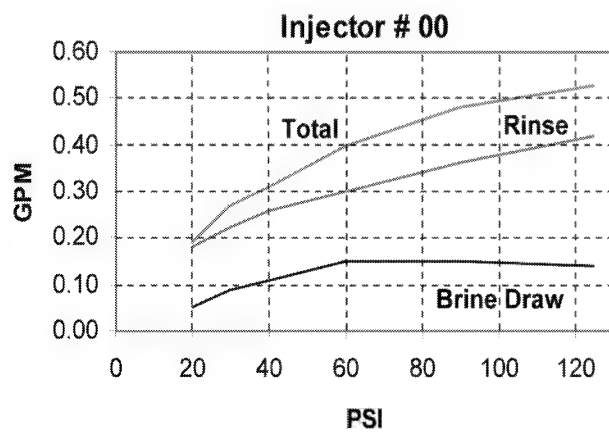
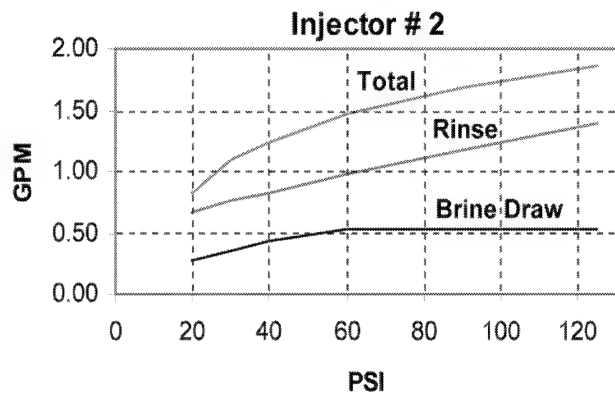
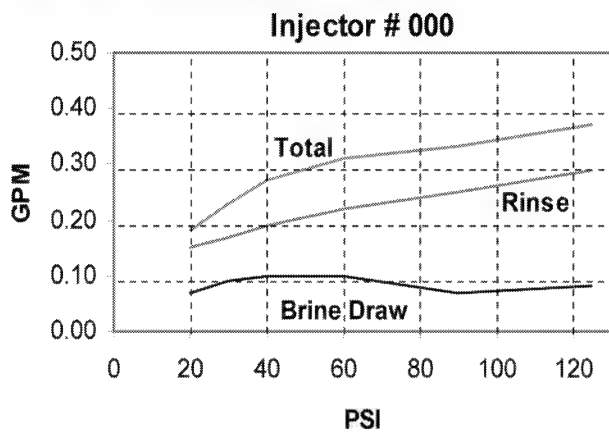


1 1/2" Meter Sleeved



TR: 18467
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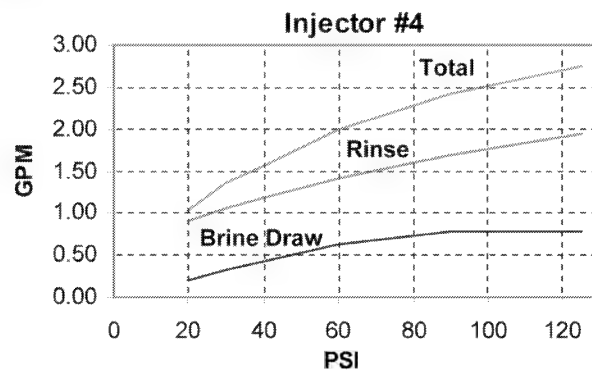
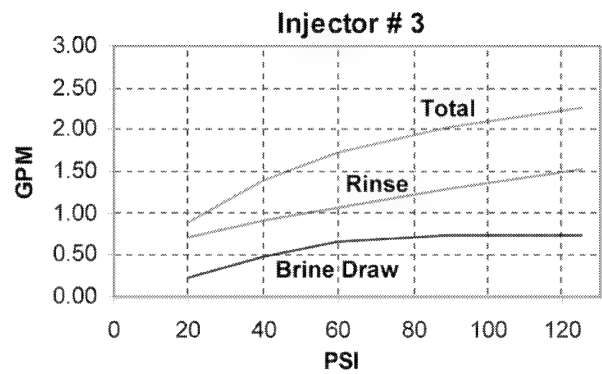
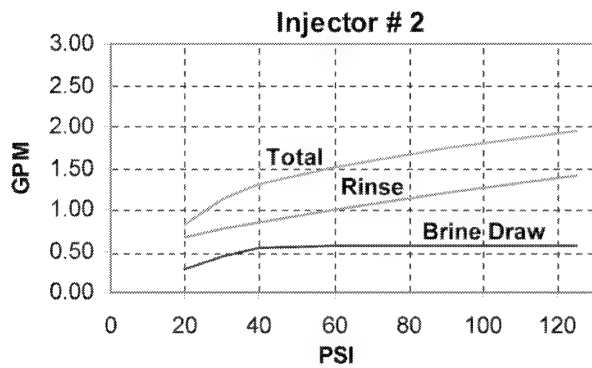
9000/9100/9500 INJECTOR FLOW DATA (1600 SERIES INJECTORS)



TR: 18467
 41092

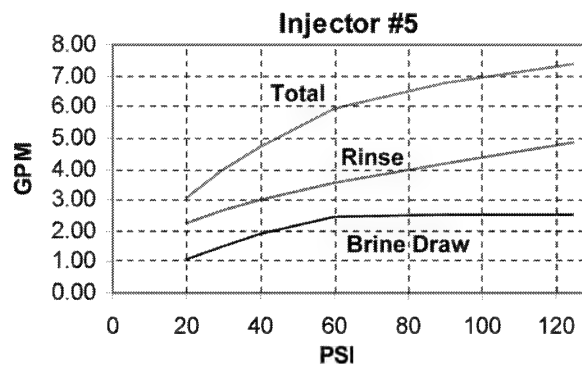
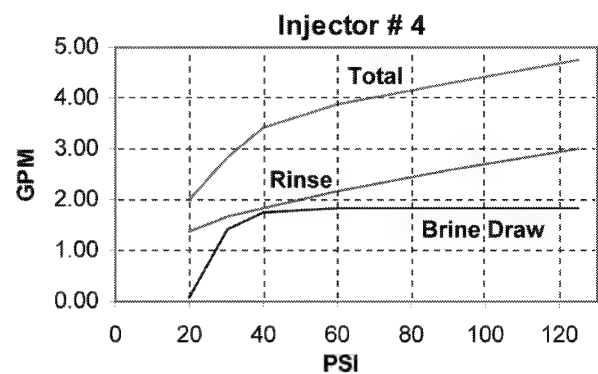
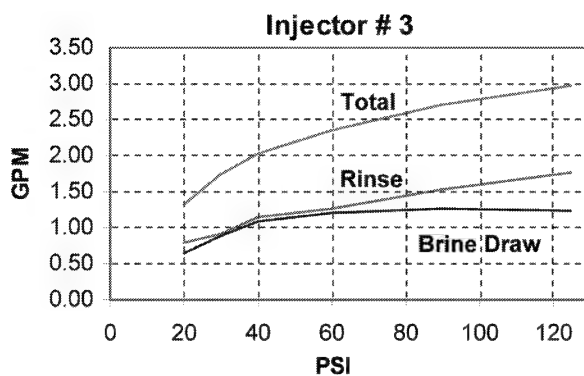
9500 INJECTOR FLOW DATA (1600 &1700 SERIES INJECTORS)

1600 Series Injectors



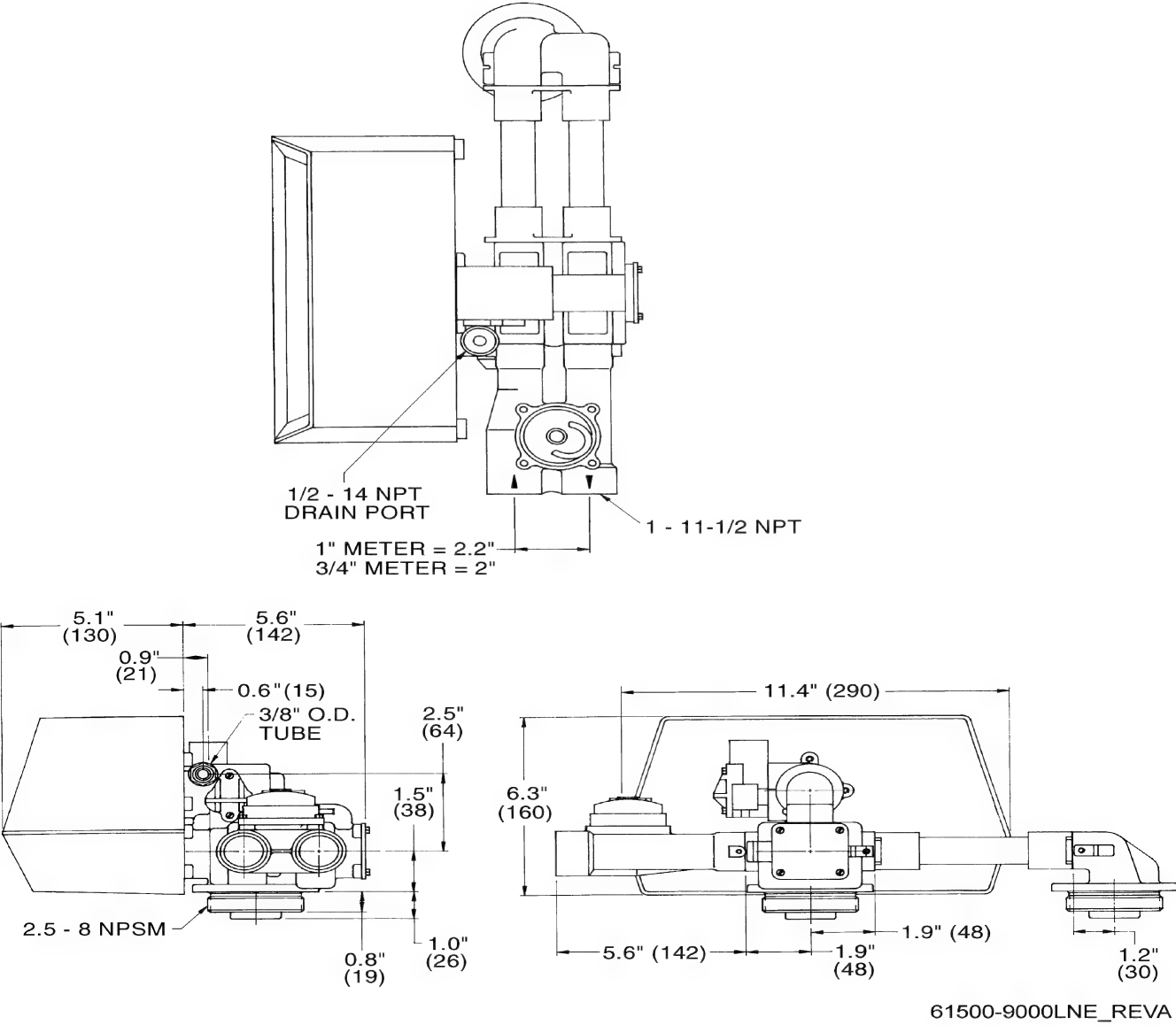
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1700 Series Injectors

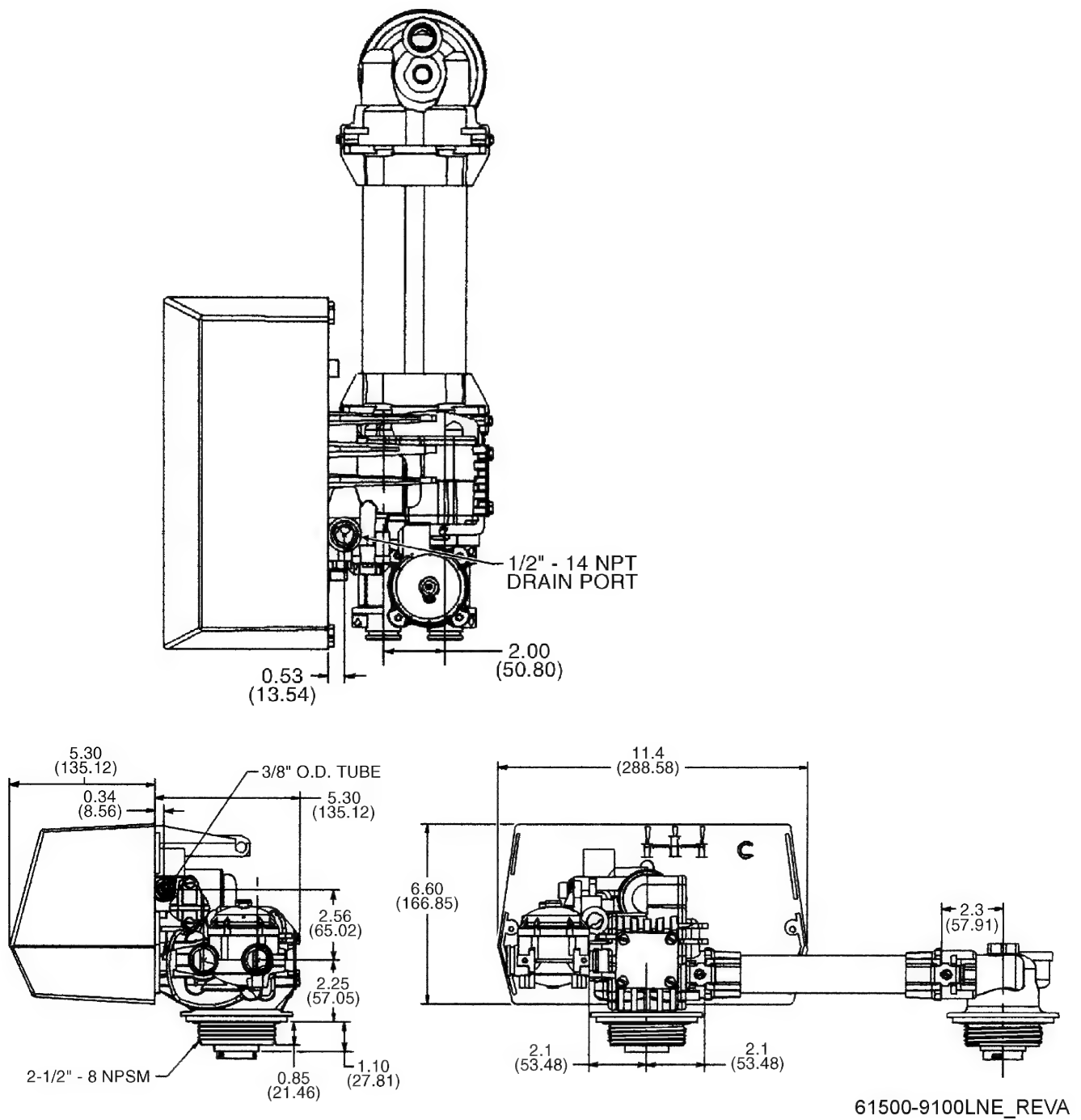


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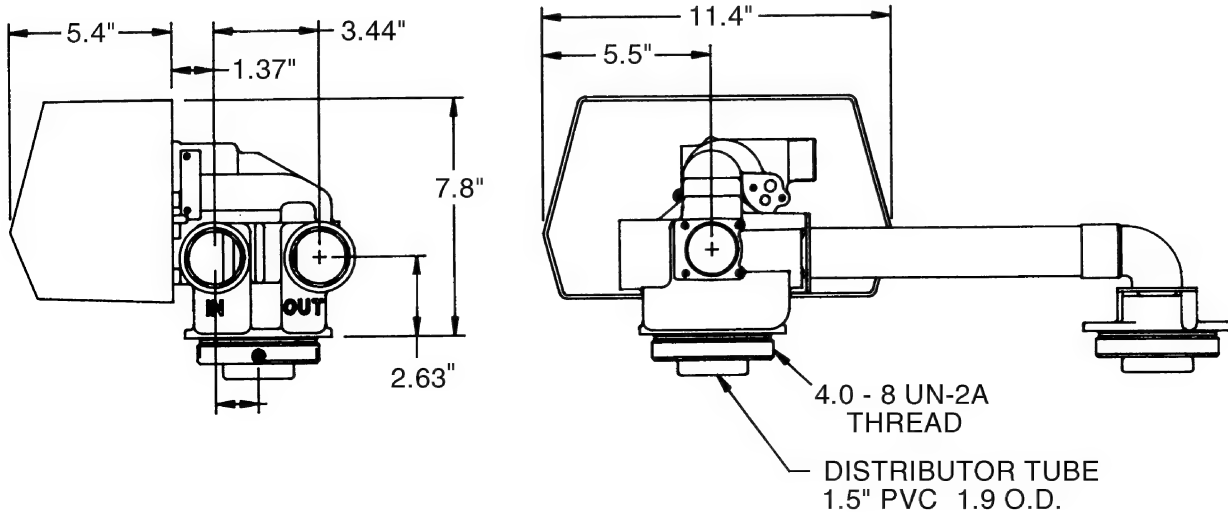
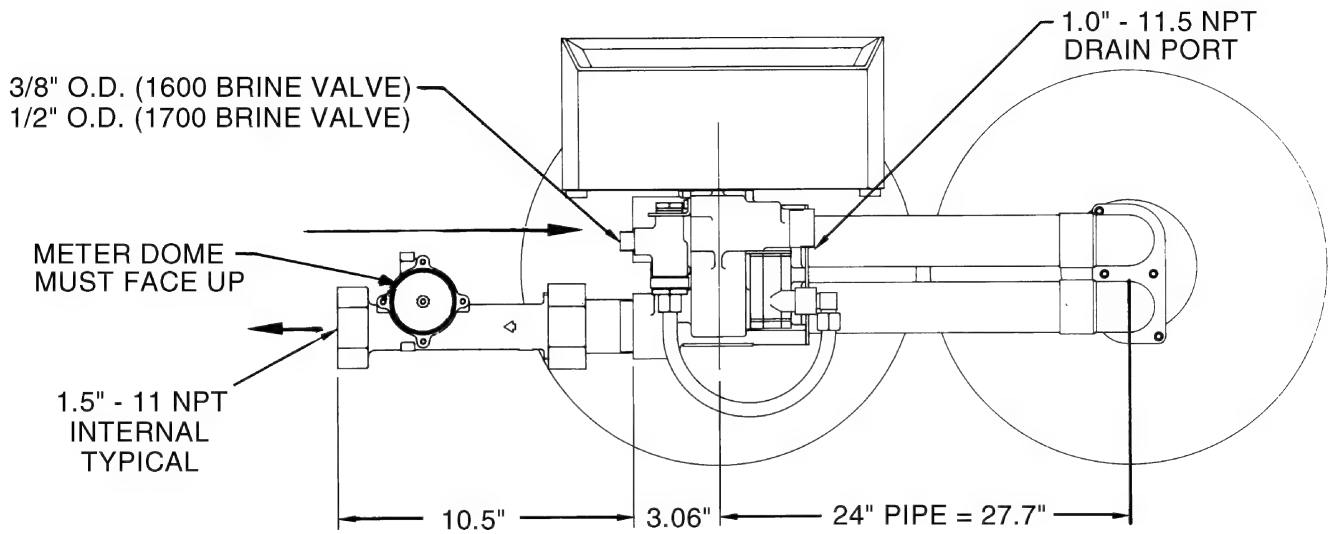
9000 CONTROL DIMENSIONS



9100 CONTROL DIMENSIONS



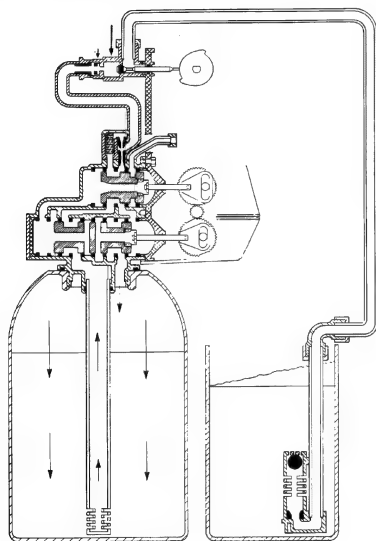
9500 CONTROL DIMENSIONS



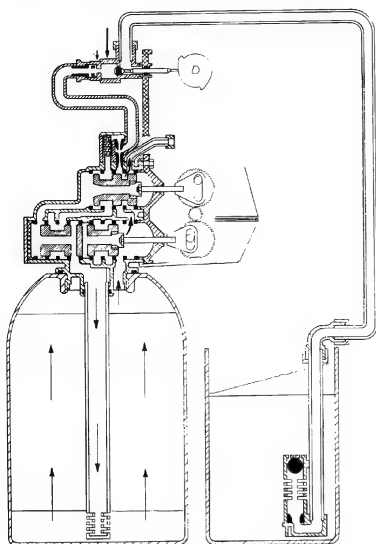
61500-9500LNE_REVA

WATER CONDITIONER FLOW DIAGRAMS

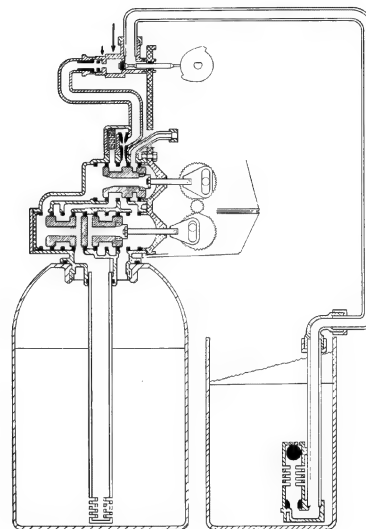
1 In Service Position



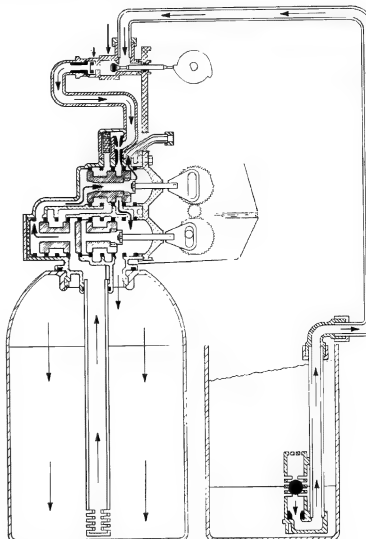
2 Backwash Position



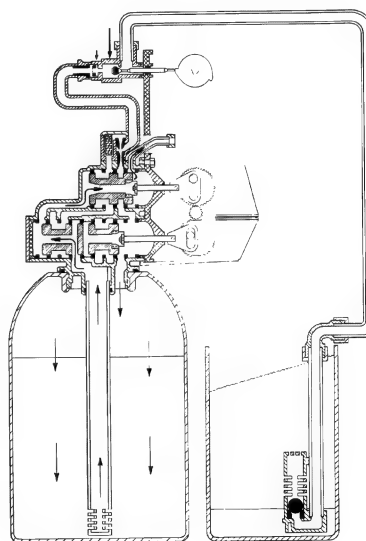
**3 Tanks Switching Position
 (Meter Initiated Regeneration)**



4 Brine Draw Position

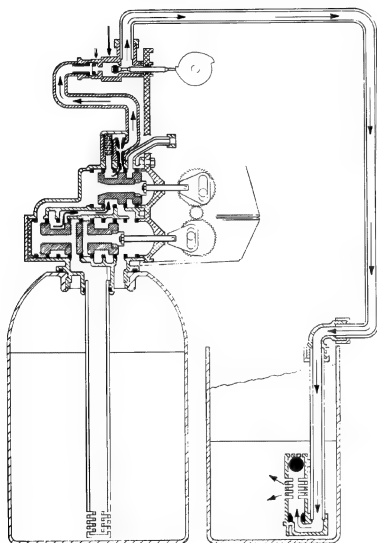


5 Slow Rinse

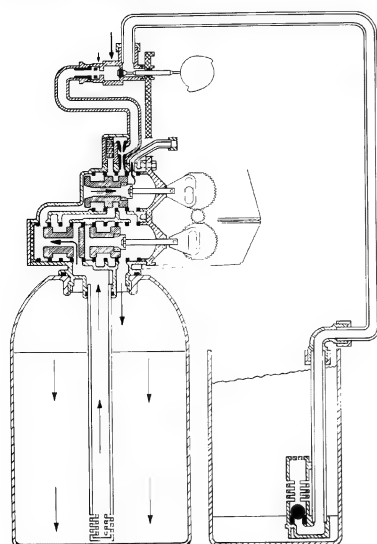


WATER CONDITIONER FLOW DIAGRAMS *continued*

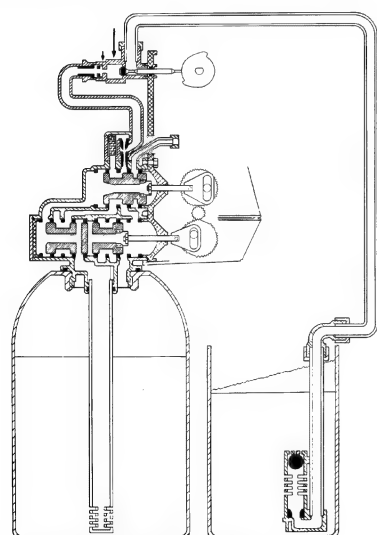
6 Brine Tank Fill Position



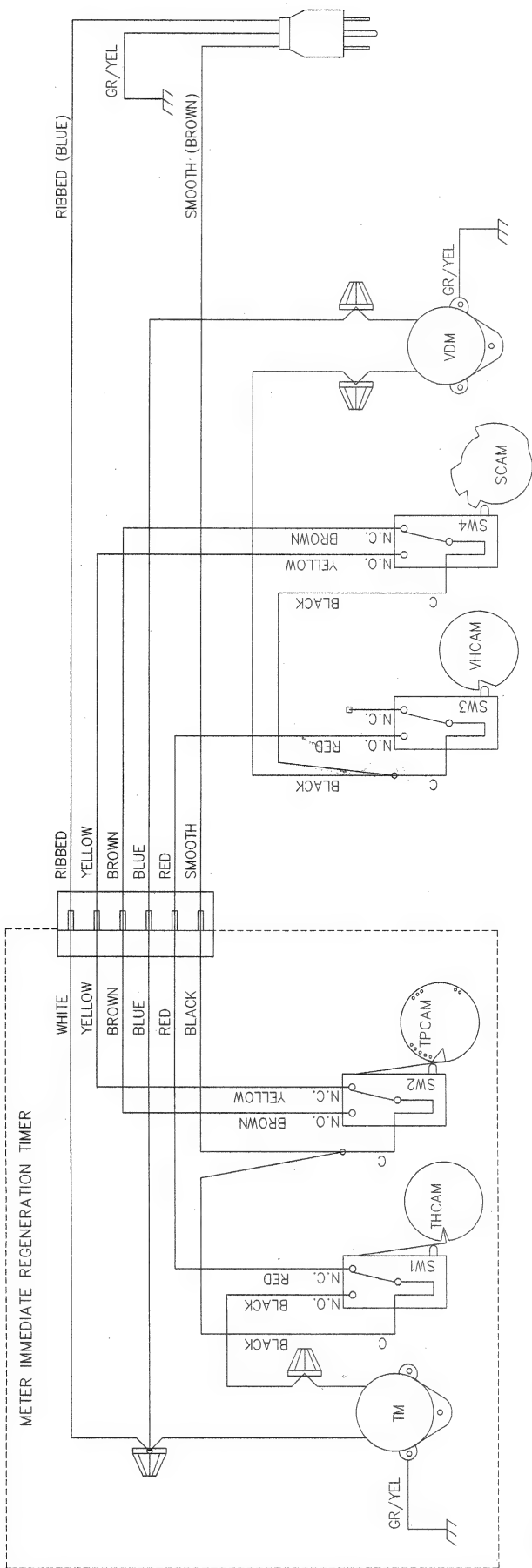
7 Rapid Rinse Position



8 In Service Position, Tanks Switched



9000/9500 WIRING DIGRAM



- TM - TIMER MOTOR
- VDM - VALVE DRIVE MOTOR
- SW1 - TIMER HOMING SWITCH
- SW2 - TIMER PROGRAM SWITCH
- SW3 - VALVE HOMING SWITCH
- SW4 - VALVE PROGRAM SWITCH
- THCAM - TIMER HOMING CAM
- TPCAM - TIMER PROGRAM CAM
- HCAM - VALVE HOMING CAM
- SCAM - VALVE STEP CAM

NOTE:
 1. TWIN TANK METER IMMEDIATE ALTERN REGENERATION.
 2. VALVE SHOWN IN SERVICE POSITION.

19752 Rev B

SERVICE ASSEMBLIES

Brine Line Flow Controls (9000/9100):

| | |
|-----------------|-------------------------------------|
| 60022-12 | BLFC, .125 GPM, 5000/5600/9000/9100 |
| 60022-25 | BLFC, .25 GPM, 5000/5600/9000/9100 |
| 60022-50 | BLFC, .50 GPM, 5000/5600/9000/9100 |
| 60022-100 | BLFC, 1.0 GPM, 5000/5600/9000/9100 |
| 60350..... | Brine Valve Assy, 9000/9100 |

Brine Line Flow Controls (9500):

| | |
|-----------------|---------------------|
| 60020-25 | BLFC, .25 GPM, 1600 |
| 60020-50 | BLFC, .50 GPM, 1600 |
| 60020-100 | BLFC, 1.0 GPM, 1600 |

Brine Valve Assemblies:

| | |
|-----------------|--|
| 60037-610 | Brine Valve, 9500/1600, .25 GPM, Cold & HW 180° |
| 60037-620 | Brine Valve, 9500/1600, .50 GPM, Cold & HW 180° |
| 60037-630 | Brine Valve, 9500/1600, 1.0 GPM, Cold & HW 180° |
| 60350..... | Brine Valve Assy 9000/9100, Cold & HW 180° |
| 60350-01 | Brine Valve Assy, 9000/9100/Twinfl100, Cold & HW 180° |

1700 Brine Valve Assemblies (9500):

| | |
|---------------|---|
| 60039-XX..... | Brine Valve, 1700/9500, Cold & HW 180° |
|---------------|---|

Bypass Assemblies:

| | |
|--------------|------------------------------|
| 60040SS..... | Bypass Valve, 5600, 3/4" NPT |
| 60041SS..... | Bypass Valve, 5600, 1" NPT |
| 60049..... | Bypass Plastic Assy |

Injector Assemblies (9000/9100):

| | |
|--------------|---|
| 60385-X..... | Injector Assembly (specify size of injector) |
|--------------|---|

| Injector | Number | DLFC | Number | BLFC | Number |
|---------------------|-----------|-----------|--------|------------|--------|
| Red #0..... | 00 | Blank ... | 0..... | Blank ... | 0 |
| White #1 ... | 01 | 1.2 | 1..... | 0.25 | 1 |
| Blue #2 | 02 | 1.5 | 2..... | 0.50 | 2 |
| Yellow #3 . | 03 | 2.0 | 3..... | 1.00 | 3 |
| Green #4...04 | 2.4 | 4 | | | |
| | | 3.0 | 5 | | |
| | | 3.5 | 6 | | |
| | | 4.0 | 7 | | |
| | | 5.0 | 8 | | |
| | | 7.0 | 9 | | |

Injector Assemblies (9500):

| | |
|----------------|---|
| 60381-03 | Injector Assy, 1700, #3, Cold & HW 150° |
| 60381-04 | Injector Assy, 1700, #4, Cold & HW 150° |
| 60381-05 | Injector Assy, 1700, #5, Cold & HW 150° |
| 60381-06 | Injector Assy, 1700, #6, Cold & HW 150° |
| 60480-01 | Injector Assy, 1600, #1, Plastic, Cold Water |
| 60480-02 | Injector Assy, 1600, #2, Plastic, Cold Water |
| 60480-03 | Injector Assy, 1600, #3, Plastic, Cold Water |
| 60480-04 | Injector Assy, 1600, #4, Plastic, Cold Water |
| 60481-21 | Injector Assy, 1600, #1, SS, HW 180° |
| 60481-21 | Injector Assy, 1600, #2, SS, HW 180° |
| 60481-21 | Injector Assy, 1600, #3, SS, HW 180° |
| 60481-21 | Injector Assy, 1600, #4, SS, HW 180° |

Meter Assemblies (9000/9100):

| | |
|----------------|--|
| 15078-01 | Adapter, 1" Coupling |
| 60086..... | Meter Assy, 5600/9000/9100, 3/4" Std/Range |
| 60087..... | Meter Assy, 5600/9000/9100, 3/4", Ext |
| 60389..... | Meter Assy, 9000/9100, 1" |
| 60389NP..... | Meter Assy, 9000/9100, 1", N/P |
| 60389-20 | Meter Assy, 9000/9100, 1", BSP/Metric |
| 60390..... | Meter Assy, 9000/9100, 1", Ext |
| 60390NP..... | Meter Assy, 9000/9100, 1", Ext, N/P |
| 60390-20 | Meter Assy, 9000/9100, 1", Ext/BSP/Metric |
| 60612..... | Meter Assy, 9000/9100, 1", Std Range, HW 150° |
| 60612NP..... | Meter Assy, 9000/9100, 1", Std Range, HW 150°, NP |
| 14038..... | Meter Cap Assy |
| 15150..... | Meter Cap Assy, Ext |
| 15218..... | Meter Cap Assy |
| 15218NP..... | Meter Cap Assy, Std, NP |
| 15237..... | Meter Cap Assy, Ext |
| 15237NP..... | Meter Cap Assy, Ext, NP |
| 13509..... | Impeller, Meter |
| 13509-01 | Impeller, Celcon, HW 150° |

SERVICE ASSEMBLIES *continued*

Meter Assemblies (9500):

| | |
|------------------|---|
| 60610-01 | Meter, 2850/9500, 1 1/2" Std |
| 60610-01HW | Meter, 2850/9500, 1 1/2" Std, HW 150° |
| 60610-01NP | Meter, 2850/9500, 1 - 1/2" Std, N/P |
| 60610-02 | Meter, 2850/9500, 1 - 1/2" Ext |
| 60610-02HW | Meter, 2850/9500, 1 1/2" Ext, HW 150° |
| 60610-02NP | Meter, 2850/9500, 1 - 1/2" Ext, N/P |
| 60610-21 | Meter, 2850/9500, 1 - 1/2" Std/BSP Metric |
| 60610-21NP | Meter, 2850/9500, 1 - 1/2" Std/BSP Metric, Nickel Plated |
| 60610-22 | Meter, 2850/9500, 1 - 1/2" Ext/BSP Metric |
| 60610-22NP | Meter, 2850/9500, 1 - 1/2" Ext/BSP Metric/Nickel Plated |
| 60611-01HW | Meter, 2850/9500, 1" Sleeve, 1 1/2" Std, HW 150° |
| 60611-01 | Meter, 2850/9500, 1" Sleeve, 1 1/2" Std Meter |
| 60611-01NP | Meter, 2850/9500, 1" Sleeve, NP 1 1/2" Std Meter |
| 60611-02 | Meter, 2850/9500, 1" Sleeve, 1 1/2" Ext Meter |
| 60611-02NP | Meter, 2850/9500, 1" Sleeve, NP 1 1/2" Ext Meter |
| 17790 | Sleeve, Meter, 1 1/2" x 1" (NOTE: when reducing a 1-1/2" meter to a 1" meter, the program wheel and timer settings must be changed to a 1" meter size) |

Meter Checker Kits:

| | |
|-------------|------------------------|
| 60460 | Meter Checker Kit, Std |
| 60461 | Meter Checket Kit, Ext |

Piston Assemblies:

| | |
|----------------|---|
| 60108 | Piston Assy, 9500, Upper |
| 60108-01 | Piston Assy, 9500, Upper, HW 180° |
| 60109 | Piston Assy, 9500, Lower |
| 60109-01 | Piston Assy, 9500, Lower HW, 180° |
| 60400 | Piston Assy, 9000/9100, Top |
| 60400-01 | Piston Assy, 9000/9100, HW Upper, 180° |
| 60401 | Piston Assy, 9000/9100, Lower |
| 60401-01 | Piston Assy, 9000/9100 Lower, HW 180° |

Seal & Spacer Kits:

| | |
|----------------|---|
| 60125 | Seal & Spacer Kit, 5600/9000 Top |
| 60125-20 | Seal & Spacer Kit, Top, 559 PE Cold and Chloramine |
| 60125HW | Seal & Spacer Kit, 9000/9100, Upper HW 180° |
| 60133-01 | Seal & Spacer Kit, 9500, Lower, Cold & HW 180° |
| 60133-20 | Seal & Spacer Kit, 9500, Lower |
| 60133-30 | Seal & Spacer Kit, 9500, Lower |
| 60134 | Seal & Spacer Kit, 9500, Upper, Cold & HW 180° |
| 60134-20 | Seal & Spacer Kit, 9500, Upper |
| 60134-30 | Seal & Spacer Kit, 9500, Upper |
| 60421 | Seal & Spacer Kit, 9000/9100, Bottom |
| 60421-20 | Seal & Spacer Kit, 9000/9100, Bottom 559PE |
| 60421HW | Seal & Spacer Kit, 9000/9100, Bottom, HW 180° |

Second Tank Assemblies (9000):

| | |
|------------------|--|
| 14202-01 | Screw, Hex Washer Mach, 8-32 x 5/16 18-8 S.S. |
| 13255 | Clip, Mounting |
| 15078-01 | Adapter Assy, 1" Coupling |
| 14864-01 | Adapter, 9000/9100, 2nd Tank, Machd w/O-rings |
| 14864-01NP | Adapter, 9000/9100, 2nd Tank, Machd, NP |
| 15823-06 | Yoke Assy, 6" Tank & 6" Tube |
| 15823-06NP | Yoke Assy, 6" Tank, NP 6" Tubes |
| 15823-12 | Yoke Assy, 6" - 12" Tank, 8 1/2 Tube |
| 15823-12NP | Yoke Assy, 6" - 12" Tank, NP 8 1/2" Tubes |
| 15823-14 | Yoke Assy, 14" Tank, 10 1/2" Tube |
| 15823-14NP | Yoke Assy, 14" Tank, NP 10 1/2" Tube |
| 15823-16 | Yoke Assy, 16" Tank, 12 1/2" Tube |
| 15823-16NP | Yoke Assy, 16" Tank, NP 12 1/2" Tube |

Second Tank Assemblies (9100):

| | |
|----------------|--------------------------------|
| 60425-12 | Tube Assy, 9100, 6-12" Tanks |
| 60425-16 | Tube Assy, 9100, 13-16" Tanks |
| 14865 | Adapter Assy, 2nd Tank, 9100 |
| 61419 | Kit, 1.05" Distributor Adapter |

Second Tank Assemblies (9500):

| | |
|------------------|---|
| 16919-01 | Valve Body, 9500 Machd |
| 16919-01NP | Valve Body, 9500 Machd, NP |
| 16919-21 | Valve Body, 9500 BSP, Mtrc, Machd |
| 16919-21NP | Valve Body, 9500 BSP, Mtrc, Machd Nickel Plated |
| 60715-16 | Tube Assy, 9500, 2nd Tank for 14" to 16" Tanks |
| 60715-16NP | Tube Assy, 9500, 2nd Tank, NP for 14" to 16" Tanks |
| 60715-20 | Tube Assy, 9500, 2nd Tank for 20" Tanks |
| 60715-24 | Tube Assy, 9500, 2nd Tank for 20" and 24" Tanks |
| 60715-24NP | Tube Assy, 9500, 2nd Tank, Nickel for 20-24" Tanks |

Single Piece Plastic End Cap Assemblies

| | |
|----------------|------------------------------|
| 61701-01 | Plug Assy, End Cap 9000/9100 |
| 61701-02 | Plug Assy, End Cap 9500 |

Tools:

| | |
|-------------|------------------------------|
| 12763 | Stuffer Tool Assy, 5600/9000 |
| 13061 | Puller Assy, Port Ring |
| 13759 | Tool, DLFC Retainer |

Valve Body Assembly (9100):

| | |
|-------------|-----------------------|
| 40688 | Valve Body Assy, 9100 |
| 18303 | O-ring, -336 |
| 18569 | Retainer, Tank Seal |

Model XT

Advanced Electronic Controller



The XT advanced electronic controller is available for single control valve operation. The XT can be configured to the Fleck® 2510, 2750, 2850, 2850s, 2900, 3150, 3900, 9000, 9100 and 9500 valves.

In Time Clock Delay mode, the XT will display the number of days until the next scheduled regeneration. Some meter delated types will display the colume remaning (SRV) minus the reserve. Once the volume remaining is zero, the display will start counting down the reserve volume and queue (RGQ) regeneration.

Features

- Time of day backup for up to 12 hours of power loss
- Calculating Reserves:
 - Daily Variable - adjusts reserve based on previous day's water usage*
 - Day of Week - adjusts reserve for each day of the week based on an average of the last three weeks*
- LED Status Indicator:
 - Blue: In Service*
 - Green: In Regeneration*
 - Red: Error with codes*
- New shift key (left arrow) for digit selecting, allows faster programming
- 2 Line/16 character LCD backlit display
- Defaults for all valve, piston, and cam types are stored
- Diagnostics:
 - Current Flow Rate*
 - Peak Flow Rate (can be reset)*
 - Totalizer (can be reset)*
 - Hours between Last two Regenerations*
 - Hours between Last Regeneration*
 - Volume Remaining (Adjustable)*
 - Precious Days Usage*
 - Reserve Volume*
 - Software Version*
- Uses same mounting hardware and cable harness as the 3200NXT and 3214NXT
- Easy installation with plug-in wiring harnesses

Options

- Programmable auxiliary relay output:
 - Dry contact Relay (fused at 3 amps)
 - Program entire Regeneration
 - Two programmable time windows during regeneration
- Remote Lock
- Programmable for Fleck® or generic meters

System Type

| | |
|--------------------------------|--------------|
| Meter Delayed Weekly Reserve | Single Valve |
| Meter Delayed Variable Reserve | Single Valve |
| Meter Delayed Fixed Reserve | Single Valve |
| Meter Immediate | Single Valve |
| Remote Signal Start Delayed | Single Valve |
| Remote Signal Start Immediate | Single Valve |
| Time Clock Delayed | Single Valve |
| Twin Tank | Single Valve |
| Volume Override Delayed | Single Valve |
| Volume Override Immediate | Single Valve |

Regenerant Flow

Downflow, Upflow Variable Fill, Upflow Brine First, Downflow DB BW, Upflow Backwash, Backwash Filter

Valve Type

2510, 2750, 2850, 2850s, 2900, 3150, 3900, 9000, 9100, & 9500

Generic Meter Guidelines

Meter power supply is +19V DC, up to 10 mA. 01-150 pulses per gallon/liter output. Open collector output, board will sink up to 10mA at 5V DC. Pulse rate generated must not exceed 100 pulses per second (100 Hz) or 6,000 pulses per minute

Electrical Rating

24V Pentair transformers:
 115V AC +/- input, 24V AC output
 230V AC +/- input, 24V AC output

Humidity

95% RH, Non-condensing

Two Programming Levels

User Mode:

Water Hardness
 Regeneration Day Override
 Regeneration Time

Master Programming:

System Type
 Valve Type
 Regenerant Flow
 Display Format
 Unit Capacity
 Capacity Safety Factor
 Water Hardness
 Regeneration Day Override
 Regeneration Time
 Cycle Steps
 Auxiliary Relay Outputs
 Flow Meter Sizes

XT

Service Manual



IMPORTANT: Fill in Pertinent Information on Page 3 for Future Reference

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IMPORTANT PLEASE READ:

- The information, specifications and illustrations in this manual are based on the latest information available at the time of printing. The manufacturer reserves the right to make changes at any time without notice.
- This manual is intended as a guide for service of the valve only. System installation requires information from a number of suppliers not known at the time of manufacture. This product should be installed by a plumbing professional.
- This unit is designed to be installed on potable water systems only.
- This product must be installed in compliance with all state and municipal plumbing and electrical codes. Permits may be required at the time of installation.
- If daytime operating pressure exceeds 80 psi, nighttime pressures may exceed pressure limits. A pressure reducing valve must be installed.
- Do not install the unit where temperatures may drop below 32°F (0°C) or above 125°F (52°C).
- Do not place the unit in direct sunlight. Black units will absorb radiant heat increasing internal temperatures.
- Do not strike the valve or any of the components.
- Warranty of this product extends to manufacturing defects. Misapplication of this product may result in failure to properly condition water, or damage to product.
- A prefilter should be used on installations in which free solids are present.
- In some applications local municipalities treat water with Chloramines. High Chloramine levels may damage valve components.
- Correct and constant voltage must be supplied to the control valve to maintain proper function.

Job Specification Sheet

NOTE: Some options may not be available depending on valve model or other options chosen.

Circle and/or Fill in the Appropriate Data for Future Reference.

System Type: Meter Immediate / Time Clock Delayed / Twin Tank / Volume Override Delay
 Volume Override Immediate / Remote Signal Start Delayed
 Remote Signal Start Immediate / Meter Delayed Week Reserve
 Meter Delayed Variable Reserve / Meter Delay Fixed Reserve

Valve Type: 2510/2850 2750 2900 3150 3900 9000/9100/9500 Proprietary A B E

Regenerant Flow: Down Flow / UF Variable Fill / UF Brine First
 Downflow DB BW / UF Backwash / Back Wash Filter

Initial Tank: Tank 1 or Tank 2

Remote Signal Start: On or Off

Display Format: U.S. or Metric (French Degrees, German Degrees, or PPM)

Unit Capacity: _____ Grains/French Degrees/German Degrees/PPM

Water Hardness: _____ Grains/French Degrees/German Degrees/PPM

Capacity Safety Factor: Zero or _____ %

Volume Override: _____ (Gallons or M³)

Regeneration Day Override: Off or Every _____ Days

Regeneration Time: Delayed _____ AM/PM or _____ Immediate

Regeneration Cycle Step #1: ____ : ____ : ____

Regeneration Cycle Step #2: ____ : ____ : ____

Regeneration Cycle Step #3: ____ : ____ : ____

Regeneration Cycle Step #4: ____ : ____ : ____

Regeneration Cycle Step #5: ____ : ____ : ____

Media Volume: _____ (CuFt or Liter)

Salt Dosage: _____ (lbs/CuFt or grams/Liter)

BLFC Size: _____ gpm

Auxiliary Relay: Enabled or Disabled

Auxiliary Relay Start 1: ____ : ____ : ____

Auxiliary Relay End 1: ____ : ____ : ____

Auxiliary Relay Start 2: ____ : ____ : ____

Auxiliary Relay End 2: ____ : ____ : ____

Chemical Pump: Enabled or Disabled

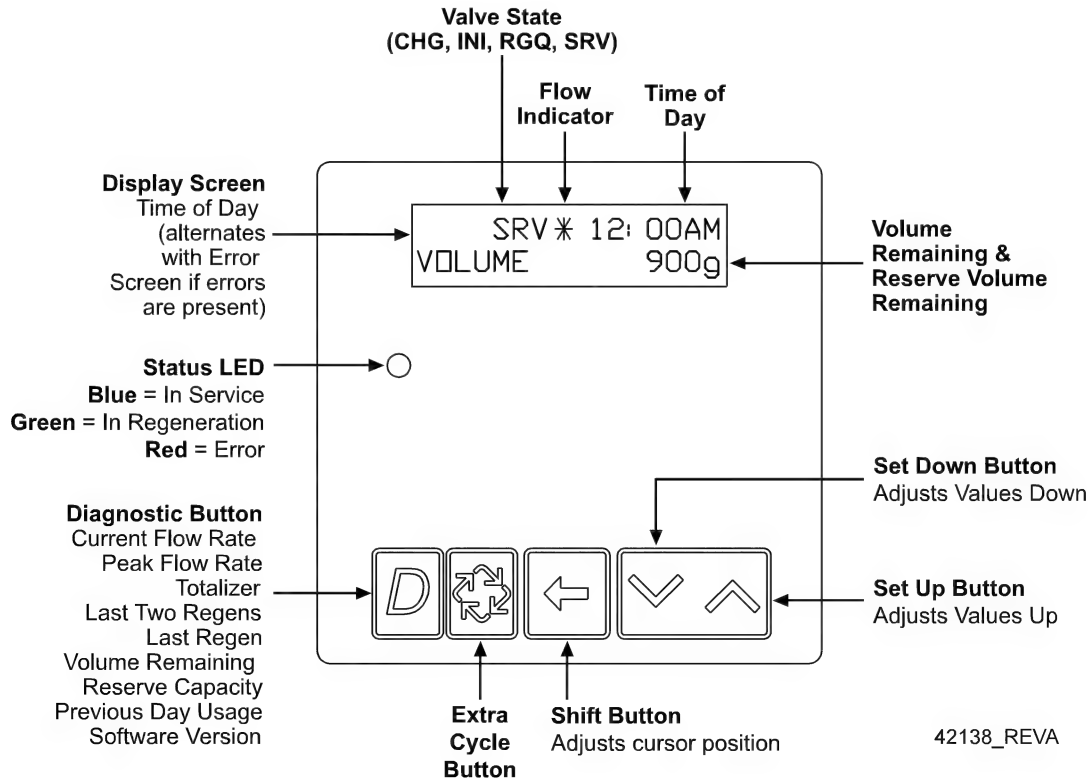
CPO Aux Relay Volume: _____ (Gallons or M³)

CPO Aux Relay: ____ : ____ : ____

Flow Meter Size: Paddle: .75" 1.0" 1.5" 2.0" 3.0"
 Turbine: .75" 1.0" 1.5"

Generic Flow Meter: Maximum Flow Rate: Add __ Gallons every __ Pulses

Timer Operation



Valve State:

CHG (Change of State)

CHG will be displayed when the lower drive changes from one state to another in dual piston valves.

INI (Initializing)

INI will display on the screen for 30 to 45 seconds when initializing after a power failure reset or programming.

RGQ (Regeneration Queued)

RGQ indicates that the reserve has been entered in a delayed system and regeneration has been queued. When in the main screen, press the Shift button to toggle service (SRV) with RGQ.

Service (SRV)

SRV will display when the unit is in service.

LED Status Lights:

Blue LED:

Illuminates while the unit is in service and no errors exist. The unit will always be in service unless a regeneration trigger has occurred (green LED light will be displayed).

Green LED:

Illuminates when the unit is in Regeneration mode, unless an error condition exists.

Red LED:

Illuminates when there is an error.

Flow Indicator:

A rotating line (appearing as a rotating star shape) will display on the screen when flow is going through the meter.

Timer Operation

Regeneration:

- A time initiated control valve regenerates when the number of programmed days has been reached
- A flow initiated control valve regenerates when the volume count is zero or is below reserve capacity

| System Type | Regeneration Trigger |
|--------------------------------|---|
| Time Clock Delayed | A) Day override parameter is reached and B) the time of day matches the regeneration day override time |
| Meter Immediate | Regenerates as soon as the volume remaining has been depleted |
| Meter Delayed Fixed Reserve | A) Volume remaining has been depleted to the fixed reserve volume and B) the regeneration time has been reached |
| Meter Delayed Variable Reserve | A) Volume remaining has been depleted to the variable reserve volume and B) the regeneration time has been reached |
| Meter Delayed Weekly Reserve | A) Volume remaining has been depleted to the weekly variable reserve volume and B) the regeneration time has been reached |
| Remote Signal Start Immediate | Immediately once a valid remote signal is asserted continuously for the programmed period of time |
| Remote Signal Start Delayed | Once a valid remote signal is asserted continuously for the programmed period of time and regeneration time has been reached |
| Volume Override Immediate | As soon as the programmed volume remaining has been depleted from the tank |
| Volume Override Delayed | As soon as soon as the programmed volume remaining has been depleted from the tank and the regeneration time has been reached |
| Twin Tank | Regenerates immediately once volume remaining has been depleted |

Timer Operation

Setting the Time of Day

1. Press and hold the Up or Down button for 2 seconds.
2. Press the Shift button to select the digit you want to modify.
3. Press the Up or Down buttons to adjust the value.
4. Press the Extra Cycle button to return to the normal display screen, or after a 5 second timeout.

NOTE: The “D” button (Diagnostic) can be pressed to exit without saving.

Manually Initiating a Regeneration

1. When timer is in service, press the Extra Cycle button for 5 seconds on the main screen.
2. The timer advances to Regeneration Cycle Step #1, and begins programmed time count down.
3. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #2 (if active).
4. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #3 (if active).
5. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #4 (if active).
6. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #5 (if active).
7. Press the Extra Cycle button once more to advance the valve back to in service.

NOTE: A manually initiated or queued regeneration can be cleared by pressing the Extra Cycle button for less than 5 seconds. A system queued regeneration can only be cleared by stepping through a manual regeneration. If regeneration occurs for any reason prior to the delayed regeneration time, the manual regeneration request shall be cleared. Pressing the Extra Cycle button while in regeneration will cause the upper drive to advance to the next step immediately.

Queued Regeneration (RGQ)

From the display screen, while the unit is in service, hold down the Extra Cycle button until “RGQ” displays. The valve will regenerate when the set regeneration time has been reached.

Timer Operation During Regeneration

In the main display screen, the timer shows the current regeneration cycle and the time for that step. The **green LED light** will display when the unit is in regeneration. Once all regeneration steps are complete, the timer returns to in service, displays a **blue LED light**, and resumes normal operation.

Timer Operation During Programming

The timer enters program mode (unit must be in service). While in the program mode the timer continues to operate normally, monitoring water usage. Timer programming is stored in memory permanently upon a normal exit from programming mode.

Timer Operation During A Power Failure

All program settings are stored in permanent memory. Current valve position, cycle step time elapsed, and time of day are stored during a power failure, and will be restored upon power re-application. Time is kept during a power failure, and time of day is adjusted upon power up (as long as power is restored within 12 hours).

NOTE: The time of day on the main display screen will flash for 5 minutes when there has been a power outage. The flashing of the time of day can be stopped by pressing any button on the display.

Regeneration Day Override Feature

If the Day Override option is turned on and the valve reaches the set Regeneration Day Override value, the Regeneration Cycle starts at the programmed regeneration time.

Timer Operation

Flow Meter Equipped Timer

As treated water is used, the Volume Remaining display counts down from the calculated system capacity, less the reserve volume. Once capacity reaches zero or reserve, if the immediate system the unit will regenerate immediately. If it is a Fixed, Variable, or Weekly reserve, the unit will queue a regeneration (RGQ) and count down Reserve Volume until the set regeneration time.

NOTE: Reserve Volume is only available in a RGQ system.

Volume Remaining (Less Reserve)

| | |
|--------|---------|
| SRV * | 08:45AM |
| VOLUME | 1000G |

Reserve Volume

| | |
|--------|---------|
| RGQ * | 09:32AM |
| VOLUME | 100G |

Master Programming Mode Flow Chart

NOTE: Depending on current option settings, some displays cannot be viewed or set.



To Set Time of Day:

Press and hold the Up or Down buttons for 2 seconds. Press the Shift button to select the digit you want to modify.

Entering Master Programming Mode:

1. Press and hold the Shift and Up buttons for 5 seconds.
OR
2. Set the Time of Day display to **12:01 P.M. or 12:01HR**. Then go to the main display screen, press the Up and Down buttons at the same time for 5 seconds.



| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | Y | S | T | E | M | T | Y | P | E | : | | | | | | | |
| T | I | M | E | | | C | L | K | | D | E | L | A | I | Y | E | D |

Options: Time Clock Delayed [TIME CLK DELAYED] (Default)
 Meter Immediate [METER IMMEDIATE]
 Meter Delayed Fixed Reserve [MTR DLY FIX RSV]
 Meter Delayed Variable Reserve [MTR DLY VAR RSV]
 Meter Delayed Week Reserve [MTR DLY WEEK RSV]
 Remote Signal Start Immediate [RSS IMMEDIATE]
 Remote Signal Start Delayed [RSS DELAYED]
 Volume Override Immediate [VOL OVERRIDE IMM]
 Volume Override Delayed [VOL OVERRIDE DLY]
 Twin Tank [TWIN TANK]



| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|--|---|---|---|---|---|---|---|---|---|--|--|--|
| V | A | L | V | E | | T | Y | P | E | : | | | | | | | |
| | | | | | | 2 | 5 | 1 | 0 | / | 2 | 8 | 5 | 0 | | | |

Options: 2510/2850 [2510/2850] (Default)
 2750 [2750]
 2900 [2900]
 3150 [3150]
 3900 [3900]
 9000/9100/9500 [9000/9100/9500]
 Proprietary A [PROPRIETARY A]
 Proprietary B [PROPRIETARY B]
 Proprietary E [PROPRIETARY E]



| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|--|---|---|---|---|---|--|--|
| R | E | G | E | N | E | R | A | N | T | | F | L | O | W | : | | |
| D | O | W | N | | F | L | O | W | | | | | | | | | |

Options: Down Flow [DOWN FLOW] (Default)
 Back Wash Filter [BACK WASH FILTER]
 Up Flow [UP FLOW]
 Up Flow Variable Fill [UF VARIABLE FILL]



NOTE: Only shown when System Type is Twin Tank

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|--|---|---|---|---|---|---|--|--|--|--|
| I | N | I | T | I | A | L | | T | A | N | K | : | | | | | |
| | | | | | | | | T | A | N | K | | 1 | | | | |

Options: Tank 1 [TANK 1] (Default)
 Tank 2 [TANK 2]



NOTE: Only shown when System Type is Remote Signal Start

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|--|---|---|---|---|---|---|---|---|--|--|--|
| R | E | M | O | T | E | | S | I | G | N | A | L | | | | | |
| S | T | A | R | T | : | | | 0 | : | 0 | 1 | : | 0 | 0 | | | |

Options: Remote Signal Start [0:01:00] (Default)
Range: 1 second to 10 hours



| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|
| D | I | S | P | L | A | Y | | F | O | R | M | A | T | | | | |
| | | | | | | U | S | - | G | A | L | L | O | N | S | | |

Options: Grains per Gallon [US-GALLONS] (Default)
 French Degrees [METRIC - M3, F°TH]
 German Degrees [METRIC - M3, G°TH]
 Parts per Million [METRIC - M3, PPM]



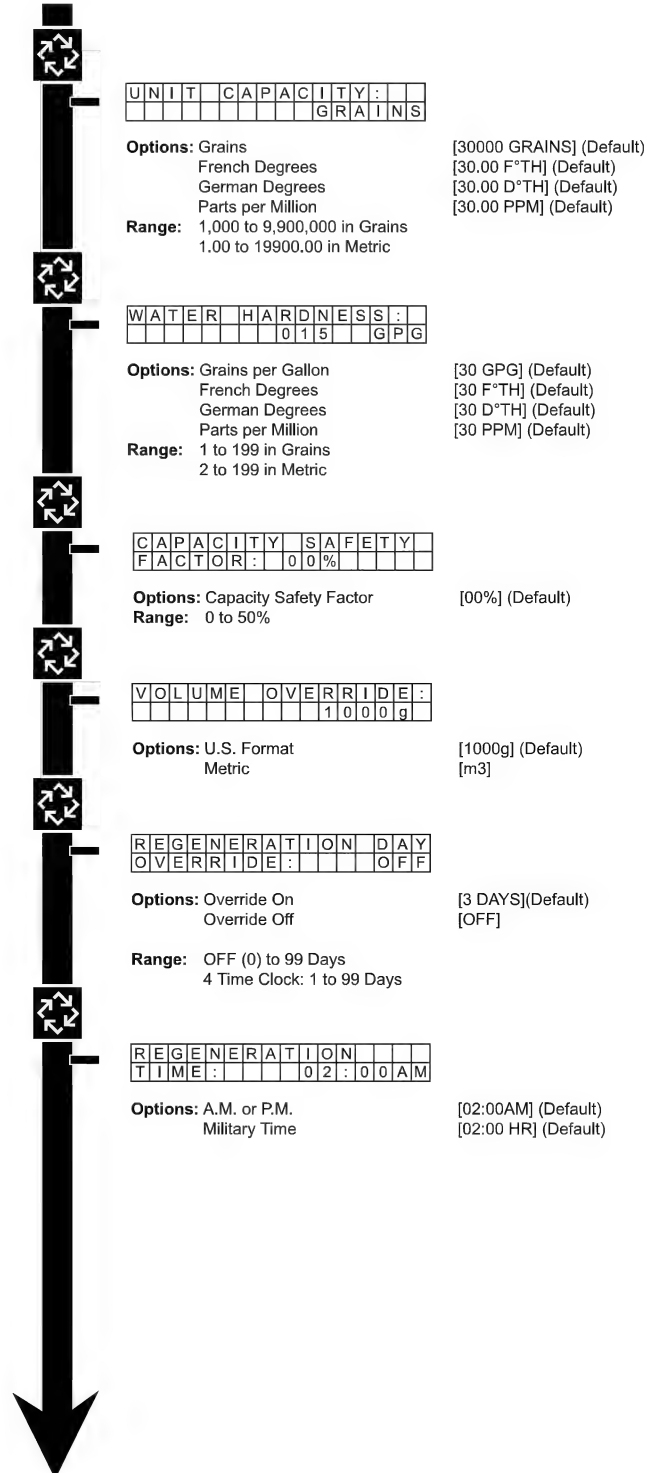
CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode Flow Chart

NOTE: Depending on current option settings, some displays cannot be viewed or set.

NOTE: Only shown when System Type is Meter Delayed Fixed Reserve or Volume Override Delayed

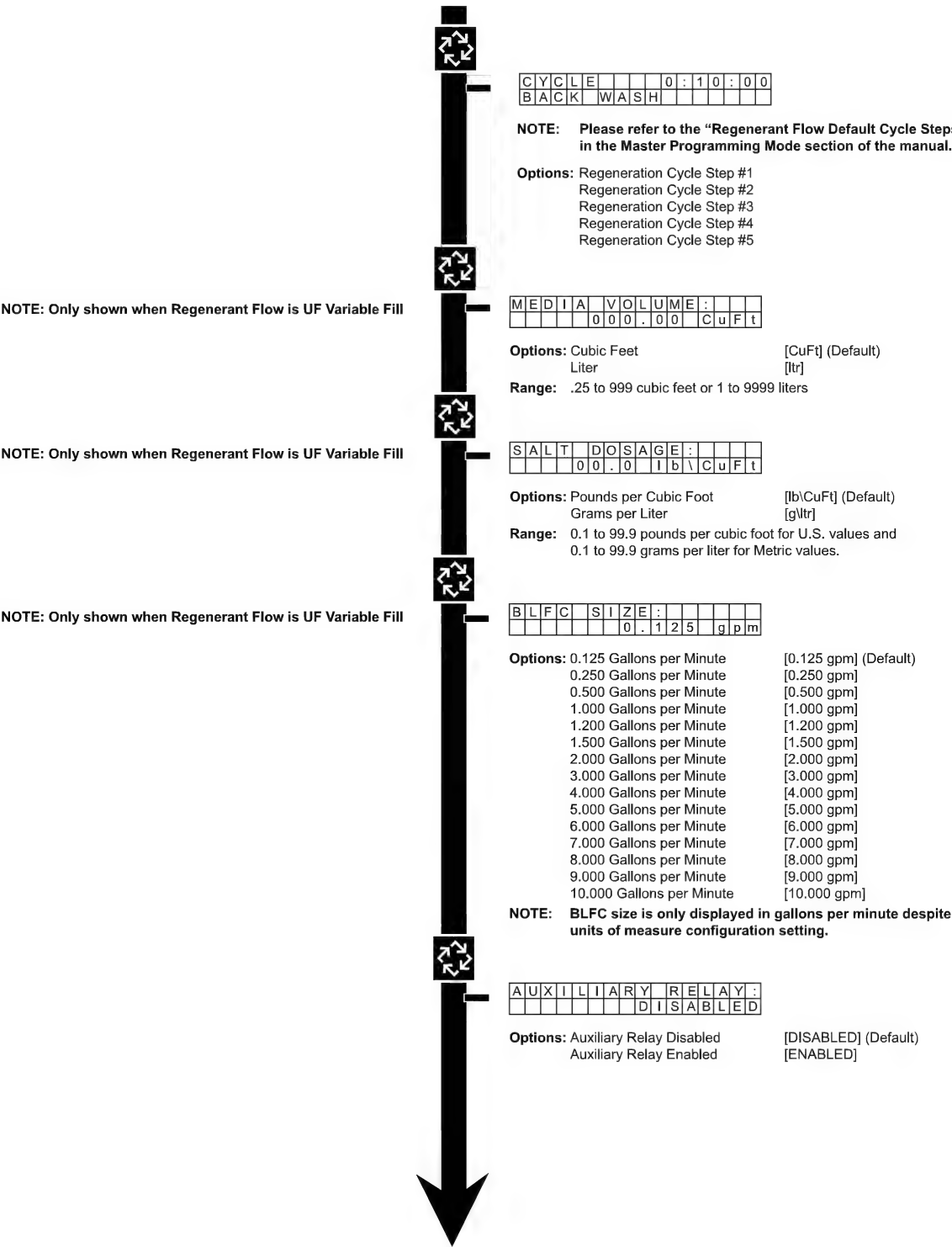
NOTE: Only shown when System Type is Volume Override Immediate or Volume Override Delayed



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode Flow Chart

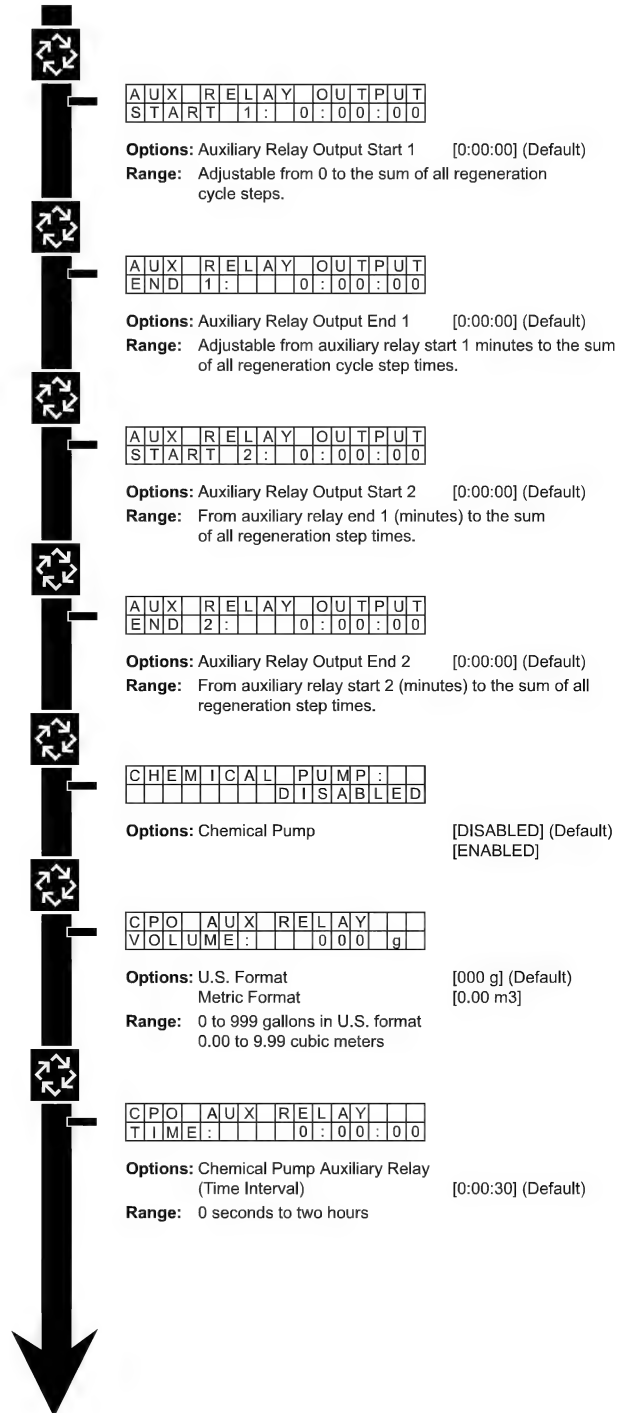
NOTE: Depending on current option settings, some displays cannot be viewed or set.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode Flow Chart

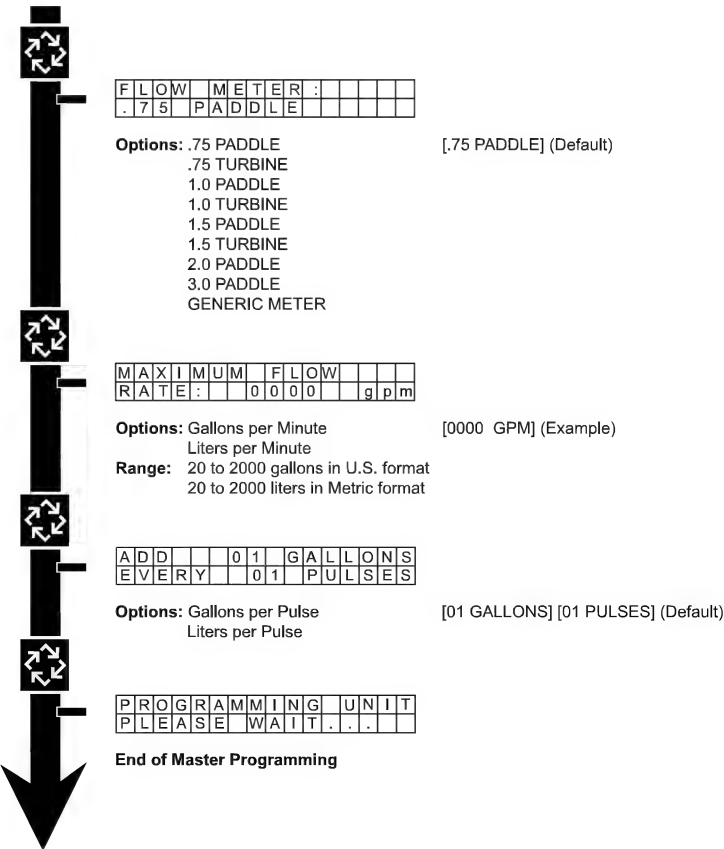
NOTE: Depending on current option settings, some displays cannot be viewed or set.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode Flow Chart

NOTE: Depending on current option settings, some displays cannot be viewed or set.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

When the Master Programming Mode is entered, parameters can be set to make the timer function as needed.

NOTE: Depending on current option settings, some displays cannot be viewed or set.

Entering Master Programming Mode:

1. Press and hold the Shift and Up buttons for 5 seconds.
OR
2. Set the time of day display to **12:01 PM** or **12:01HR** (See the User Programming section to learn how to do this). Then go to the main display screen, press the Up and Down buttons at the same time for 5 seconds.

Exiting Master Programming Mode:

1. Press the Extra Cycle button once per display until all are viewed. Master Programming Mode is exited and the normal display screen appears.
2. To exit the Master Programming Mode without saving, press the Diagnostic button.

NOTE: If no keypad activity is made for 5 minutes while in the Master Programming Mode, or if there is a power failure, no changes will be made, and the unit will go back to the main display screen.

Resets:

Soft Reset: Press and hold the Up and Down buttons for 25 seconds until 12:00PM (or 12:00HR) appears. This resets all parameters except for the flow meter totalizer volume.

Master Reset: Hold the Shift button while powering up the unit. This resets all of the parameters in the unit. Check and verify the choices selected in Master Programming Mode.

1. System Type

This program step selects the system type.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
SYSTEM TYPE:  4
TIME CLK DELAYED
```

2. Valve Type

This program step selects the valve type.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
VALUE TYPE:
2510/2850
```

3. Regenerant Flow

This program step selects how the regenerant flows through the tank (must match cam). The selections available will vary depending on the previously chosen valve model.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
REGENERANT FLOW:
DOWN FLOW
```

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

4. Display Format

This program step selects the display format.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

DISPLAY FORMAT:
 US - GALLONS

5. Unit Capacity

This program step selects the timer's total capacity of hardness that can be removed.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

UNIT CAPACITY:
 0030000 GRAINS

6. Feed Water (Hardness)

This program step is used to set the feed water hardness. The system will automatically calculate volume remaining based on the unit capacity, capacity safety factor (reserve systems only), and feed water hardness entered.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

WATER HARDNESS:
 030 GPG

7. Capacity Safety Factor

This program step is used to set the reserve capacity of the unit. This is a percentage by which the unit's capacity is reduced.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

CAPACITY SAFETY
 FACTOR: 00%

8. Volume Override

This program step is used to set the volume override of the unit.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

9. Regeneration Day Override

This program step sets the maximum amount of time (in days) the unit can be in service without a regeneration.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
REGENERATION DAY
OVERRIDE:01 DAYS
```

10. Regeneration Time

This program step sets the time of day for the regeneration to occur in delayed systems.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

```
REGENERATION
TIME: 02:00AM
```

11. Regeneration Cycle Step Programming

This program step programs the Regeneration Cycle step times 1 through 5. Please refer to the chart below for regenerant flow default cycle steps and times.

```
CYCLE 1 00:10:00
BACK WASH
```

| Regenerant Flow | Cycle 1 | Time | Cycle 2 | Time | Cycle 3 | Time | Cycle 4 | Time | Cycle 5 | Time |
|------------------|--------------------|------------|--------------------|------------|----------------------|------------|-----------------|------------|-------------|------------|
| Down Flow | Back Wash | 10 Minutes | Brine & Slow Rinse | 1 Hour | Rapid Rinse | 10 Minutes | Brine Tank Fill | 12 Minutes | N/A | N/A |
| Back Wash Filter | Back Wash | 15 Minutes | Draw | 0 | Settling Rinse | 10 Minutes | Refill | 0 | N/A | N/A |
| UF Variable Fill | Brine & Slow Rinse | 10 Minutes | Pause & Delay | 1 Hour | Variable Rapid Rinse | N/A | Brine Tank Fill | 12 Minutes | Rapid Rinse | 10 Minutes |
| Upflow | Brine & Slow Rinse | 1 Hour | Back Wash | 10 Minutes | Rapid Rinse | 10 Minutes | Brine Tank Fill | 12 Minutes | N/A | N/A |

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

12. Media Volume

This program step sets the volume of the media in the resin tank.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

MEDIA VOLUME:
 000.00 CuFt

13. Salt Dosage

This program step sets the salt dosage in the unit.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

SALT DOSAGE:
 00.0 lb/CuFt

14. Brine Line Flow Control Size

This program step allows the selection of the desired brine line flow control size in the unit (must match physical brine line flow control).

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

BLFC SIZE:
 0.125 GPM

15. Auxiliary Relay Output

The next two displays are part of a series of settings used to program the optional relay output. The first setting turns the output on/off during regeneration only. The second turns the output on during service only, every time a set volume of water used has accumulated.

NOTE: When auxiliary outputs are in the OFF (default) setting, press the Up or Down buttons to set the first setting. Then press the Extra Cycle button to advance to the second setting.

a. Timed Auxiliary Relay Output Window (Start & End Time Setting)

This option setting consists of two displays. The first display sets the turn-on time of the output, referenced to the start of the first regeneration cycle. The second display sets the output turn-off time, referenced again to the start of the first regeneration cycle. An OFF setting cancels this setting. All settings are in minutes and output timing is synchronized with regeneration cycle timing.

Start Time: Any time during regeneration.

End Time: At start time, and anytime during the regeneration cycle.

AUXILIARY RELAY:
 DISABLED

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

Master Programming Mode

b. Chemical Pump Auxiliary Relay Output Window

This option setting consists of two displays. The first display sets the volume of water flow at which the output turns on. The second display sets the on time (in seconds) of the output.

- Activate output after volume set is reached.
- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

CHEMICAL PUMP:
 DISABLED

16. Flow Meter Size

This program step sets the size of the flow meter.

- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

FLOW METER:
 .75 TURBINE

17. Maximum Flow Rate

This program step sets maximum flow rate of the generic flow meter.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

18. Pulses per Gallon/Liter

This program step sets the pulses per gallon/liter for generic flow meters.

- Press the Shift button to select the digit you want to modify.
- Press the Up or Down buttons to adjust this value.
- Press the Extra Cycle button.

19. End of Master Programming Mode

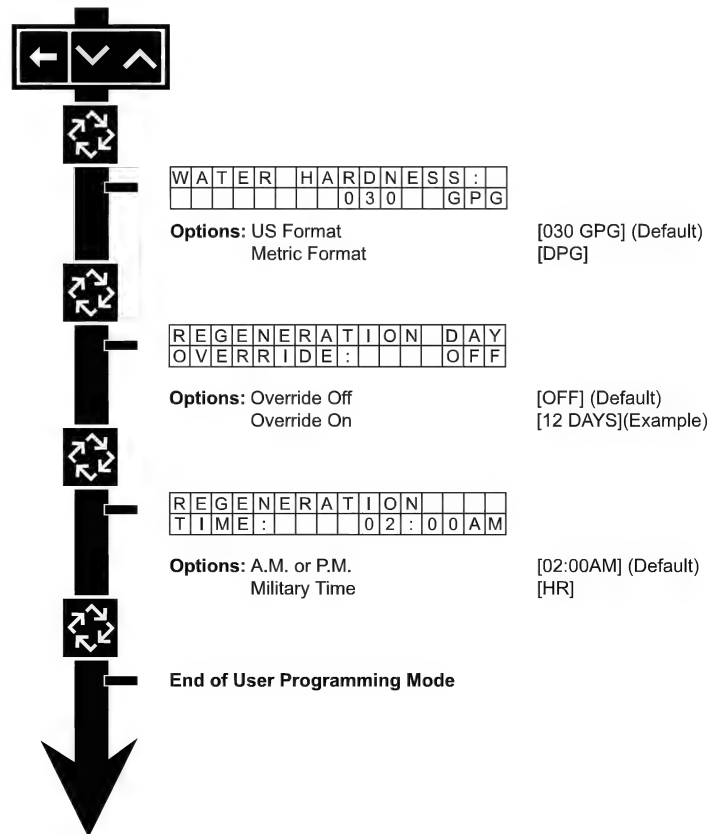
CAUTION: Before entering Master Programming, please contact your local professional water dealer.

User Programming Flow Chart & Mode

NOTE: Depending on current option settings, some displays cannot be viewed or set.

Entering User Mode:

Press and hold the Up and Down buttons for 5 seconds at any time other than 12:01 PM.



NOTE: Depending on current option settings, some displays cannot be viewed or set.

1. Enter User Mode

- Press and hold the Up and Down buttons for 5 seconds.

2. Set Feed Water Hardness

- Press the Shift, Up, and Down buttons to move the cursor and change the value of the numbers.
- Press the Extra Cycle button to proceed to the next step.

NOTE: Only displayed when a metered option is chosen under System Type.

3. Set Regeneration Day Override

- To turn on and set the days, press the Down button.
- Press the Shift, Up, and Down buttons to move the cursor and change the value of the numbers.
- Press the Extra Cycle button to proceed to the next step.

4. Regeneration Time

- Press the Shift, Up, and Down buttons to move the cursor and change the value of the numbers.
- Press the Extra Cycle button

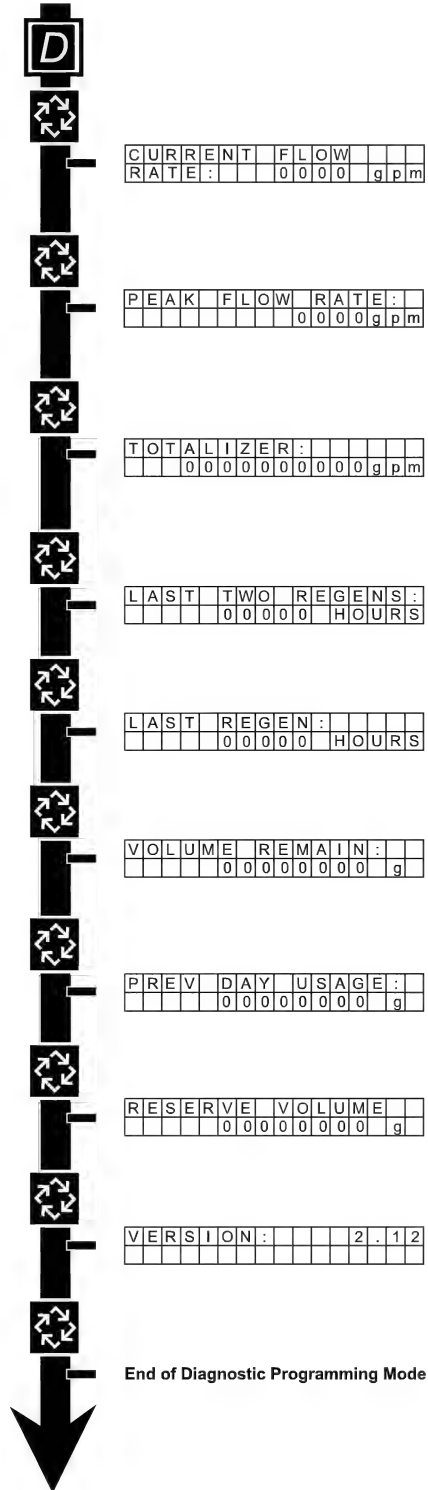
5. End of User Programming Mode

Diagnostic Programming Mode Flow Chart

NOTE: Depending on current option settings, some displays cannot be viewed or set.

Entering Diagnostic Mode:

1. Press and release the "D" button.
2. Press the Extra Cycle button once per display until all displays are viewed and the normal display screen appears.
3. Press and release the "D" button during this mode to exit the Diagnostic Mode.
4. Depending on current option settings, some displays cannot be viewed.



Diagnostic Programming Mode

NOTE: Depending on current option settings, some displays cannot be viewed.

Overview Diagnostic Mode

The current Diagnostic Programming Mode screen will display until either the Extra Cycle button is pressed through for each screen, or the Diagnostic button is pressed. In the event of regeneration occurring while in the Diagnostic Programming Mode, the regeneration step and time remaining will be displayed. When regeneration completes, the display will return to the normal time of day display screen.

Entering and Exiting Diagnostic Mode

Press and release the "D" button to enter the Diagnostic Programming Mode. Pressing the Extra Cycle button will move to the next diagnostic screen. Press the Extra Cycle button once per display until all are viewed. Pressing the Diagnostic button while in Diagnostic Mode will cause the unit to leave the Diagnostic Mode and return to the normal time of day display screen.

1. Current Flow Rate

This program step displays the calculated flow rate for the timer. The below flow rates are the maximum flow rate the timer will read for each meter.

| | | | |
|---------------------|---------------------|----------------------|--------------------|
| .75" Paddle: | 15 gpm (0.06 m3/m) | .75" Turbine: | 15 gpm (0.06 m3/m) |
| 1" Paddle: | 40 gpm (0.15 m3/m) | 1" Turbine: | 90 gpm (0.34 m3/m) |
| 1.5" Paddle: | 180 gpm (0.68 m3/m) | 1.5" Turbine: | 90 gpm (0.34 m3/m) |
| 2" Paddle: | 350 gpm (1.32 m3/m) | | |
| 3" Paddle: | 500 gpm (1.89 m3/m) | | |

— Press the Extra Cycle button.

2. Peak Flow Rate

This program step displays the peak flow rate (1 minute average) since the last regeneration.

— Press the Extra Cycle button.

3. Totalizer

This program step displays the total volume of treated water that passes through the meter.

— Reset to zero by holding the Up and Down buttons for five seconds while in the totalizer screen.

— Press the Extra Cycle button.

4. Hours Between Last Two Regenerations

This program step displays the time between the last two regenerations saved.

— Press the Extra Cycle button.

5. Hours Since Last Regeneration

This program step displays the hours since the last regeneration.

— Press the Extra Cycle button.

6. Volume Remaining

This program step displays the volume remaining. The timer will regenerate if the volume remaining is set to zero. The maximum ranges are the same as the maximum volume calculated on the main screen.

— Press the Extra Cycle button.

7. Previous Day's Water Usage

This program step displays the previous day's water usage.

— Press the Extra Cycle button.

8. Reserve Volume

This program step displays the reserve capacity, ensuring soft water is available at all times.

— Press the Extra Cycle button.

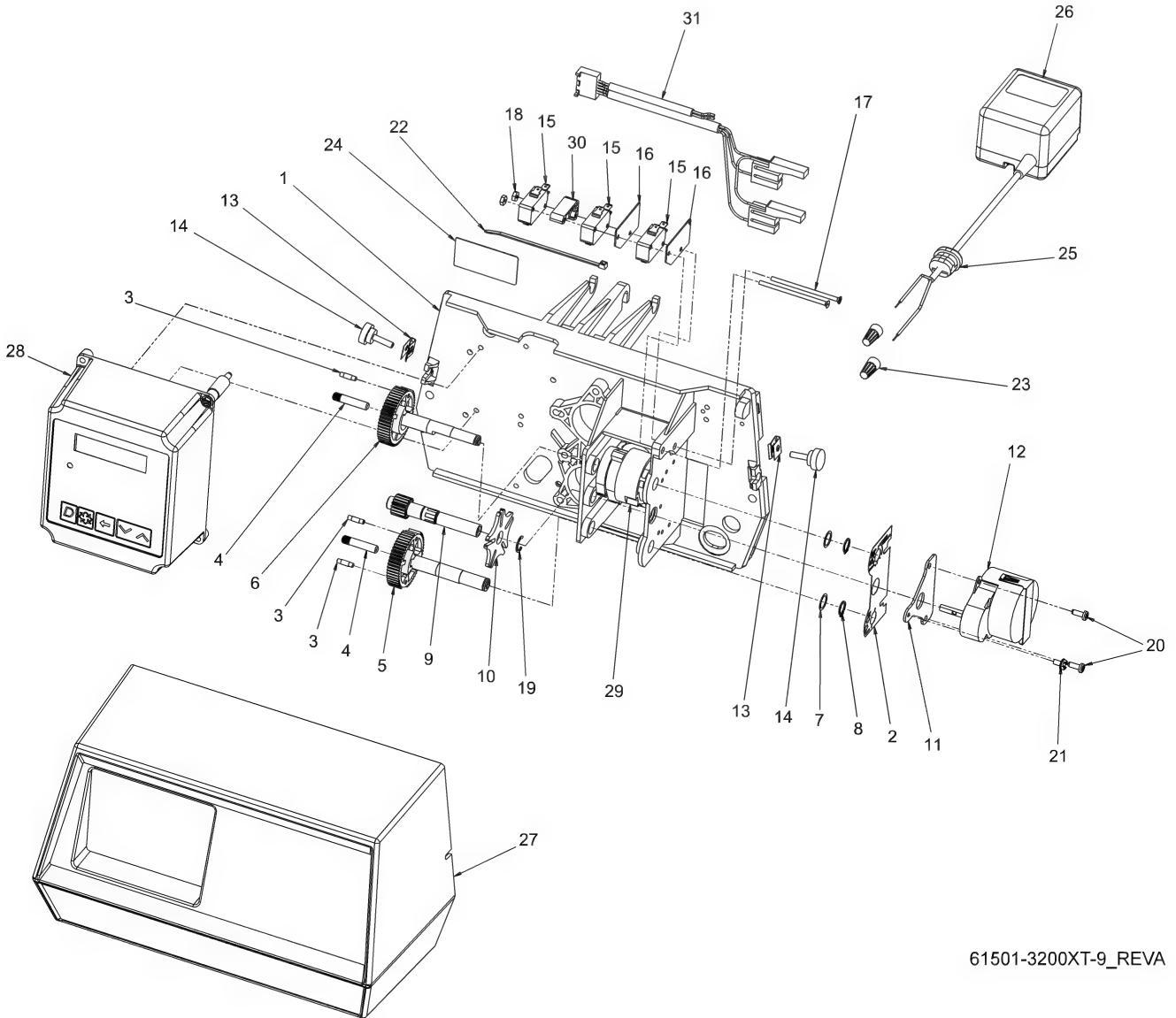
9. Software Version

This program step displays the timer's software program version number.

— Press the Extra Cycle button to exit.

NOTE: Diagnostic Programming Mode will stop if the system goes into a regeneration.

9000/9100/9500 Power Head Assy



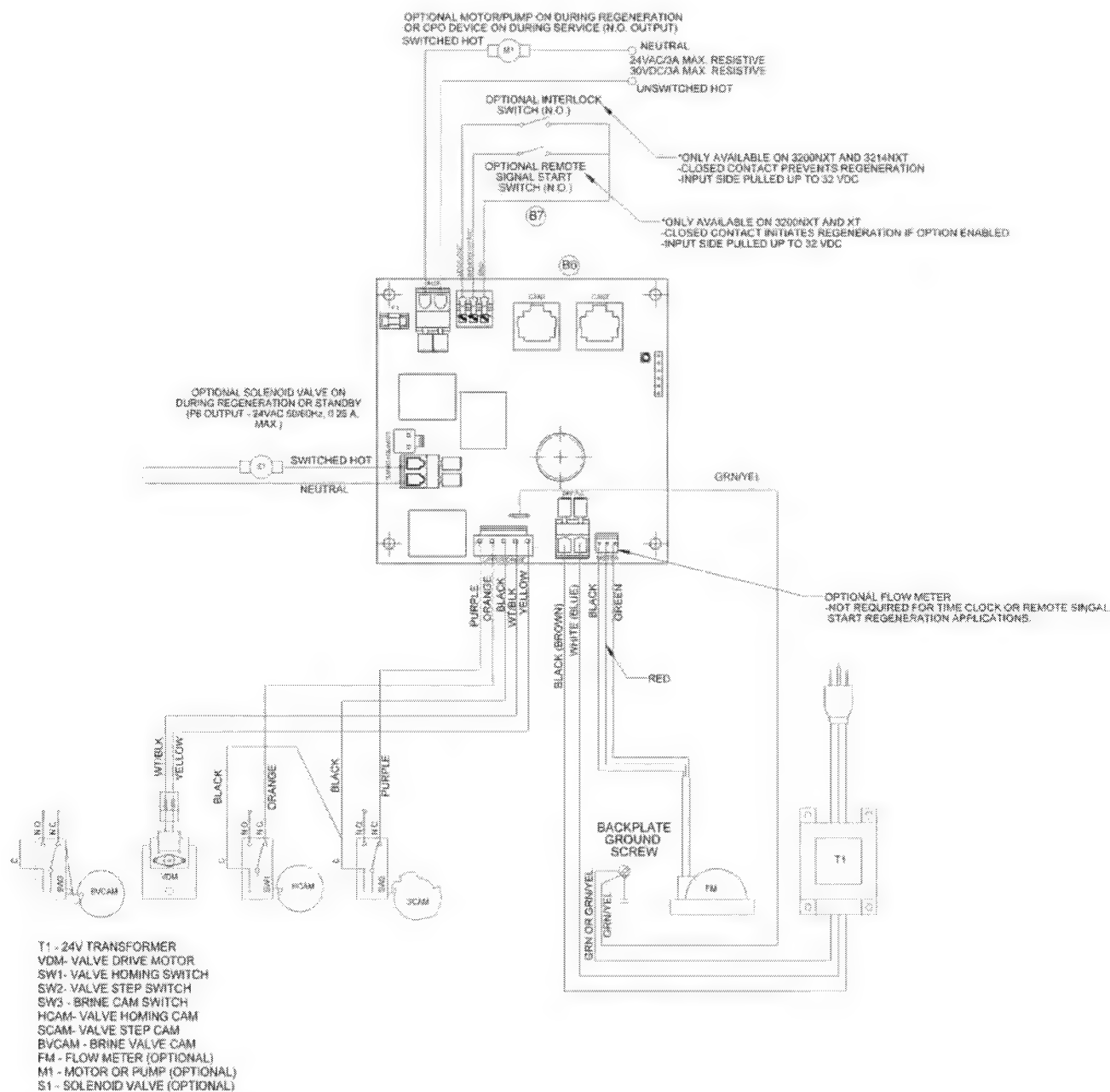
61501-3200XT-9_REVA

9000/9100/9500 Power Head Assy

| Item No. | Quantity | Part No. | Description |
|------------|----------|-----------|---|
| 1 | 1 | 17784-05 | Panel, Control, 9000/9500, ET |
| 2 | 1 | 15175 | Label, Shaft Position |
| 3 | 3 | 15209 | Pin, Roll, 1/8 x 1/2 SS |
| 4 | 2 | 15367 | Pin, Dowel, 9000 |
| 5 | 1 | 17869 | Gear, Drive, 1/2" Stroke |
| 6 | 1 | 17868 | Gear, Drive, 3/4" Stroke, 9000 |
| 7 | 2 | 15692 | Washer, Plain, 3/8" |
| 8 | 2 | 14917 | Ring, Retaining |
| 9 | 1 | 15135 | Gear, Drive, 9000 |
| 10 | 1 | 14896 | Wheel, Geneva |
| 11 | 1 | 15199 | Plate, Ground, 9000/9500 |
| 12 | 1 | 18737 | Motor, 24V, 50/60 Hz, 1 RPM |
| 13 | 2 | 18728 | Nut, Tinneman, U Type, 8-32 |
| 14 | 2 | 19367 | Screw, Designer Cover, Thumb |
| 15 | 3 | 16433 | Switch, Miniature |
| 16 | 2 | 10302 | Insulator, Limit Switch |
| 17 | 2 | 16442 | Screw, Slot Flat Hd, 4-40 x 2.12" |
| 18 | 2 | 10339 | Nut, Hex, 4-40 Zinc Plated |
| 19 | 1 | 15810 | Ring, Retaining |
| 20 | 2 | 19160 | Screw, Phil Pan, Thread, 6-32 x 3/8 |
| 21 | 1 | 14430 | Screw, Hex Wsh St, 6 x 1/4 |
| 22 | 1 | 14044 | Tie, Cable, Heyco VNT# 4-18 |
| 23 | 2 | 40422 | Nut, Wire, Tan |
| 24 | 1 | 41587 | Label, Serial Number, Stock |
| 25 | 1 | 13547-01 | Strain Relief, Euro Round Cord |
| 26 | 1 | 19674 | Transformer, 24V, 9.6VA |
| 27 | 1 | 60232-112 | Cover, Designer, 1 Pc Black |
| 28 | 1 | 42466-02 | Timer Assy, XT, Left Hand |
| 29 | 1 | 17765 | Cam Assy, Aux Switch, 9500 |
| 30 | 1 | 18803-01 | Spacer, Switch, Machd |
| 31 | 1 | 42197 | Wire Harness, 5066, 50DP, 9000, 9100, 9500 XT |
| Not Shown: | | | |
| | 1 | 19121-08 | Meter Cable Assy, NT, 35" 2/Connector |
| | 1 | 19791-02 | Meter Cable Assy, 35" |

NOTE: For all other service part numbers, see the Service Manual that accompanies the control valve.

Single Piston Wiring Diagram

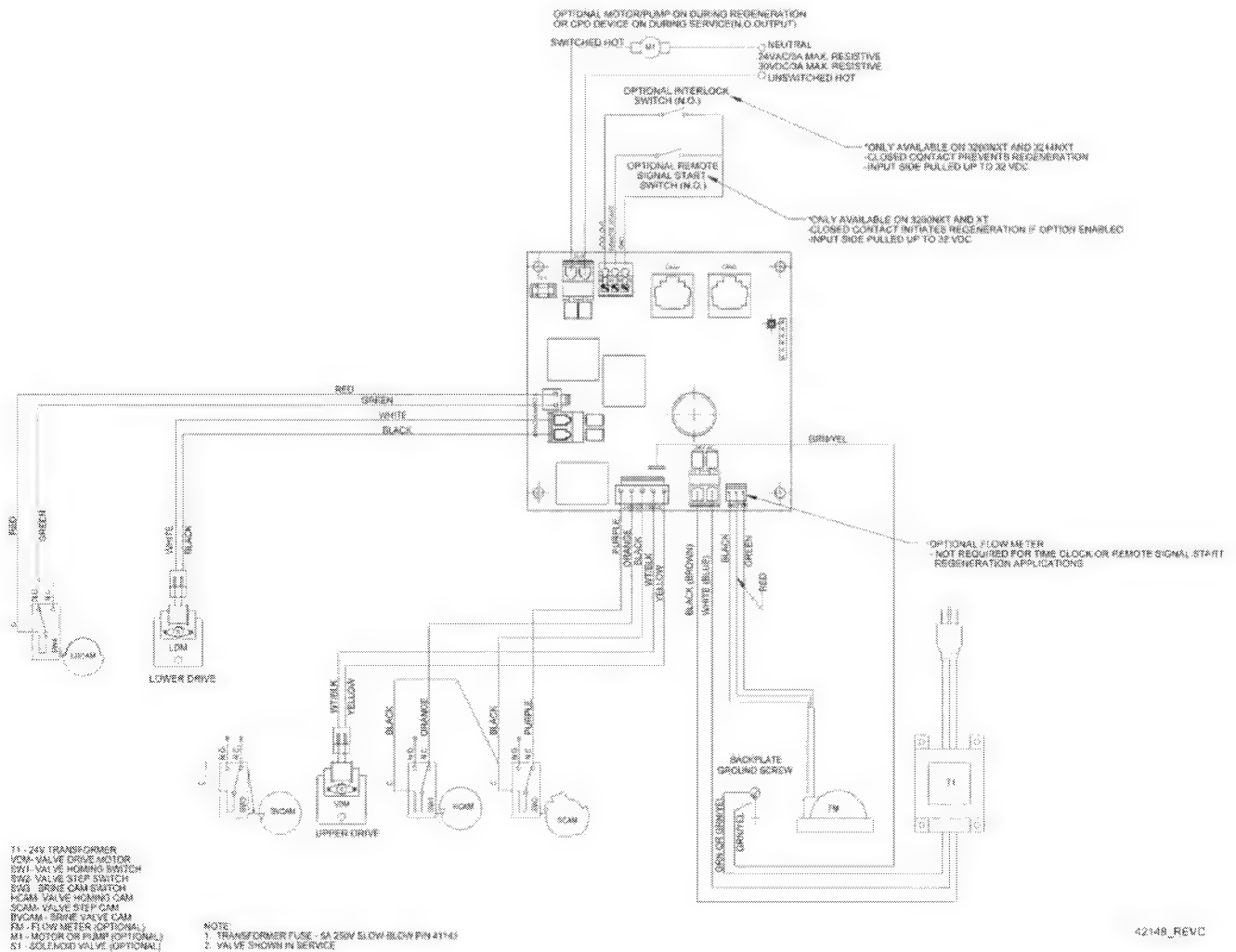


T1 - 24V TRANSFORMER
 VDM- VALVE DRIVE MOTOR
 SW1- VALVE HOMING SWITCH
 SW2- VALVE STEP SWITCH
 SW3 - BRINE CAM SWITCH
 HCAM- VALVE HOMING CAM
 SCAM- VALVE STEP CAM
 BVCAM - BRINE VALVE CAM
 FM - FLOW METER (OPTIONAL)
 M1 - MOTOR OR PUMP (OPTIONAL)
 S1 - SOLENOID VALVE (OPTIONAL)

NOTE:
 1. TRANSFORMER FUSE - 5A 250V SLOW-BLOW P/N 41143
 2. VALVE SHOWN IN SERVICE

42140_REV D

Dual Piston Wiring Diagram



Troubleshooting - Timer

If an error is detected, an error screen will alternate with the main display screen every few seconds, and the **LED light will be red**.

During an error condition, the unit continues to monitor the flow meter and update the remaining capacity. Once an error condition is corrected, the unit returns to the operating status it was in prior to the error, and regeneration resumes according to normal programming. If an error is cleared by reprogramming the unit in the Master Programming Mode, the volume remaining may be reset to the full unit capacity (as though it had just regenerated). If an error is present, a regeneration can only occur manually by pressing and holding the Extra Cycle button for 5 seconds. If the unit was in regeneration when the error occurred, it will complete the regeneration cycle and go into service.

When the problem is corrected, and the error no longer displays (it may take several seconds for the unit to stop displaying the error message), the unit will return to normal operation. The **LED light** will no longer be **red**, and will turn **Green** if the unit is regenerating, or **Blue** if the unit is in service.

| Problem | Correction |
|---|---|
| A. Flashing/blinking display | A. Power outage has occurred. Either wait 5 minutes for blinking to stop, or press any key on the keypad. |
| B. Unit not responding after going into regeneration | B. Verify the unit is configured correctly (ex: wiring valve type). Perform a Master Reset by holding the Shift button and cycling power. Check and verify the choices selected in Master Programming Mode. |
| C. Unit displays "ERROR CODE: REPLACE UNIT" (corrupted UAP) | C. Contact your local water treatment professional. |

Error Codes

| Error Code | Display Message | Correction |
|------------|-----------------------------|---|
| 01 | ERROR CODE: PROGRAM UNIT | Go through all screens in Master Programming Mode. |
| 02 | ERROR CODE: PROGRAM UNIT | Go through all screens in Master Programming Mode. |
| 03 | ERROR CODE: SERVICE UNIT | Perform a Master Reset by holding the Shift button and cycling power. Go through all screens in Master Programming Mode. Manually initiate a regeneration cycle by pressing the Extra Cycle button for 5 seconds. |
| 04 | ERROR CODE: SERVICE UNIT | Perform a Master Reset by holding the Shift button and cycling power. Go through all screens in Master Programming Mode. Manually initiate a regeneration cycle by pressing the Extra Cycle button for 5 seconds. |
| 05 | ERROR CODE: SERVICE UNIT | Call your local water treatment professional as soon as possible. Leave the unit running (do not unplug). |

NOTE: If the above corrections do not work, please contact your local water treatment professional.

Error Display Screen Examples

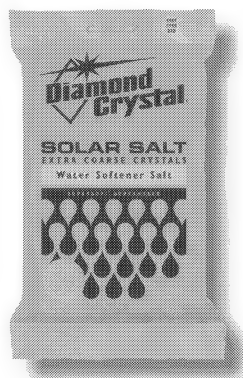
| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| E | R | R | O | R | | C | O | D | E | : | | | | | |
| S | E | R | V | I | C | E | | U | N | I | T | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| E | R | R | O | R | | C | O | D | E | : | | | | | |
| P | R | O | G | R | A | M | | U | N | I | T | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| E | R | R | O | R | | C | O | D | E | : | | | | | |
| R | E | P | L | A | C | E | | U | N | I | T | | | | |



High Purity Solar Softener Salt



Diamond Crystal® Extra Coarse Solar Salt

Our high purity water softener salt contains up to 99.6% pure salt. Evaporated naturally by the sun and wind, these solar crystals have a white, opaque appearance and a low insoluble content. They are also formulated to resist mushing and bridging, minimizing the accumulation of brine tank residue.

- Now... poly bags made of 50% recycled material
- NSF certified, this salt is recommended for side-by-side softeners

Extra Coarse Solar Salt



Diamond Crystal® Extra Coarse Solar Salt

| Product | Item Number/ Chep Item Number | Pallet Ct. | Pallet Pattern (tiers) | Pallet Dimensions | Product & Pallet Wt. | Package Cube | Package Dimension | Gross Wt. | GTIN individual (UPC) | GTIN pallet |
|------------------|----------------------------------|---------------|---------------------------|----------------------|-------------------------|-----------------|----------------------|-----------|--------------------------|-------------------|
| 25 lb Poly Bag | n/a | 100 | 10 tiers of 10 | 40x48x36 | 2560 | .58 cu. ft. | 24x14x3 | 25.5 lbs. | 000-13600-01111 6 | 100-13600-01111 3 |
| 25 lb Paper Bag | 100012450/100012451 | 100 | 10 tiers of 10 | 40x48x36 | 2560 | .36 cu. ft. | 21x12x2.5 | 25.5 lbs. | 000-13600-01110 9 | 100-13600-01110 6 |
| 40 lb Poly Bag | 100012411/100012454 | 63 | 9 tiers of 7 | 40x48x36 | 2580 | .90 cu. ft. | 28x16x3.5 | 40.5 lbs. | 000-13600-76940 6 | 100-13600-76940 3 |
| 40 lb Paper Bag | 100012452/100012453 | 63 | 9 tiers of 7 | 40x48x36 | 2580 | .56 cu. ft. | 24x13.5x3 | 40.5 lbs. | 000-13600-01112 3 | 100-13600-01112 0 |
| 50 lb Poly Bag | 100012455/100012456 | 49 | 7 tiers of 7 | 40x48x36 | 2510 | .78 cu. ft. | 27.5x16.5x3 | 50.5 lbs. | 000-13600-74940 8 | 100-13600-74940 5 |
| 50 lb Paper Bag | 100012457/100012458 | 49 | 7 tiers of 7 | 40x48x36 | 2510 | .81 cu. ft. | 25x14x4 | 50.5 lbs. | 000-13600-75940 7 | 100-13600-75940 4 |
| 60 lb Poly Bag | 100012459/100011463 | 40 | 8 tiers of 5 | 40x48x40 | 2450 | .86 cu. ft. | 29x17x3 | 60.5 lbs. | 000-13600-01103 1 | 100-13600-01103 8 |
| 80 lb Poly Bag | 100012445 | 30 | 6 tiers of 5 | 40x48x36 | 2460 | 1.78 cu. ft. | 32x19.25x5 | 80.5 lbs. | 000-13600-72940 0 | 100-13600-72940 7 |
| 20 kg Poly Bag | 100012448 | 56 | 8 tiers of 7 | 40x48x40 | 2549 | 1.02 cu. ft. | 28x15.75x4 | 20.25kg | 000-13600-01106 2 | 100-13600-01106 9 |
| 35 kg Poly Bag | 100012449 | 30 | 6 tiers of 5 | 40x48x34.5 | 2395 | 1.78 cu. ft. | 32.5x19x5 | 35.25kg | 000-13600-01109 3 | 100-13600-01109 0 |
| 18.1kg Poly Bag | 100012127 | 63 | 9 tiers of 7 | 40x48x36 | 2580 | .90 cu. ft. | 28x16x3.5 | 40.5 lbs. | 000-13600-01133 8 | 100-13600-01133 5 |
| 22.7 kg Poly Bag | 100012128 | 49 | 7 tiers of 7 | 40x48x36 | 2510 | .78 cu. ft. | 27.5x16.5x3 | 50.5 lbs. | 000-13600-01134 5 | 100-13600-01134 2 |

All specifications are approximate. Please contact your broker or Cargill representative for exact specifications.

We welcome your questions and comments. Please call us
 at 1-888-385-7258 (SALT) or visit us online at www.diamondcrystalsalt.com.

Cargill Salt

P.O. Box 5621 Minneapolis, MN 55440



Material Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

| | |
|------------------------------|---|
| Chemical Product Name | Sodium Chloride (Salt) |
| Chemical Family | Alkali Metal/Halide |
| Chemical Name | Sodium Chloride |
| INCI Name | SODIUM CHLORIDE |
| INN Name | sodium chloride |
| Formula | NaCl |
| Molecular Weight | 58.44 |
| Commercial Name | Diamond Crystal® Solar Salt - Extra Coarse, Diamond Crystal® Solar Salt - Coarse, Private Label |
| Manufacturer | Emergency Telephone Numbers |
| Cargill Salt | CHEMTREC (800) 424-9300 |
| P.O. Box 5621 | |
| Minneapolis, MN 55440 | |

2. COMPOSITION/INFORMATION ON INGREDIENTS

Description

White crystalline solid

Ingredient Name

| CAS Number | Exposure Limits | Concentration (%) |
|---------------------------|-----------------|-------------------|
| Sodium Chloride 7647-14-5 | | 100 |

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

None – GRAS Substance (Generally Recognized As Safe)

Potential Health Effects

Route(s) Of Entry: Ingestion, skin/eye contact, inhalation.

Human Effects and Symptoms of Overexposure:

Acute Inhalation: Irritation of the respiratory tract.

Chronic Inhalation: No applicable information found for chronic system effects.

Acute Skin Contact: Large amounts can cause irritation, and, if applied to damaged skin, absorption can occur with effects similar to those via ingestion.

Chronic Skin Contact: No applicable information found for chronic system effects.

Acute Eye Contact: Irritation with burning and tearing (salt concentrations greater than the normal saline present).

Chronic Eye Contact: No applicable information found for chronic systemic effects.

Acute Ingestion: Intake of large amounts has generally occurred for deliberate reasons: suicide, absorption, and to induce vomiting. The following effects were observed; nausea and vomiting, diarrhea, cramps, restlessness, irritability, dehydration, water retention, nose bleed, gastrointestinal tract damage, fever, sweating, sunken eyes, high blood pressure, muscle weakness, dry mouth and nose, shock, cerebral edema (fluid on brain), pulmonary edema (fluid in lungs), blood cell shrinkage, and brain damage (due to dehydration of brain cells). Death is generally due to cardiovascular collapse or CNS damage. Less than a few grams would not be harmful. For larger quantities, drink large amounts of water or milk.

Chronic Ingestion: No applicable information found for chronic systemic effects.

Carcinogenicity

NTP: Not listed as carcinogen or mutagen.

IARC: Not listed as carcinogen or mutagen.

OSHA: Not listed as carcinogen or mutagen.

Medical Conditions Aggravated by Exposure: In some cases of confirmed hypertension, ingestion may result in elevated blood pressure.

HMIS Health: 1, **Flammability:** 0, **Reactivity:** 0, **Protective Equipment:** A

4. FIRST AID MEASURES

First Aid for Eyes: For eye contact, flush with water immediately, lifting eyelids occasionally.

First Aid for Skin: Remove clothing from affected area. Wash skin thoroughly. Rinse carefully.

First Aid for Inhalation: If person breathes large quantities, remove to fresh air at once. If breathing stops, apply artificial respiration immediately.

First Aid for Ingestion: Less than a few grams would not be harmful. For larger quantities, drink large amounts of water or milk.

5. FIRE AND MEASURES

Flash Point: N/A

Extinguishing Media: N/A. This product is nonflammable.

Special Fire Fighting Procedures: N/A

6. ACCIDENTAL RELEASE MEASURES

Spill or Leak Procedures: Contain spills to prevent contamination of water supply or sanitary sewer system. Vacuum or sweep into containers for proper disposal.

7. HANDLING AND STORAGE

Storage Temperature (min./max.): Avoid humid or wet conditions as product will cake and become hard.

Special Sensitivity: Avoid contact with strong acids.

Handling and Storage Precautions: Becomes hygroscopic at 75% relative humidity.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection Requirements: Eyeglasses or goggles should be worn in dusty areas.

Skin Protection Requirements: Protective clothing may be worn in dusty areas, but is generally not required.

Respiratory/Ventilation Requirements: NIOSH/MSHA approved respirator for particulates.

Exposure Limits: Not listed.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form: White crystalline solid with slight halogen odor.

Color: White to opaque.

Odor: Halogen odor when heated.

Boiling Point (760mm Hg)(°C): 1465

Melting Point/Freezing Point (°C): 801

pH: 6.7 – 10.0

Solubility in Water (g/cc)(%): 26.4

Specific Gravity (H₂O = 1): 2.16

Bulk Density (lbs./ft³): 35-83

% Volatile by Weight: N/A

Vapor Pressure (mm Hg/747°C): 2.4

Vapor Density (Air=1): N/A

10. REACTIVITY

Stability: Stable

Incompatibilities: Avoid contact with strong acids. Becomes corrosive to metals when wet.

Decomposition Products: May evolve chlorine gas when in contact with strong acids.

11. TOXICOLOGICAL INFORMATION

Description: Not listed.

12. ECOLOGICAL INFORMATION

Ecotoxicity: Not listed.

Environmental Degradation: Not listed.

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method: Follow applicable Federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

D.O.T. Shipping Name: Not listed.

Technical Shipping Name: Not listed.

D.O.T. Hazard Class: Not listed.

U.N./N.A. Number: Not listed.

Product Rq (lbs.): N/A

D.O.T. Label: Not listed.

D.O.T. Placard: N/A

Freight Class Bulk: N/A

Freight Class Package: N/A

Product Label: N/A

15. REGULATORY INFORMATION

OSHA Status: Not listed.

TSCA Status: Listed as non-hazardous.

CERCLA Reportable Quantity SARA Title III

Section 302 Extremely Hazardous Substances: Not listed.

Section 311/312 Hazard Categories: Not listed.

Section 313 Toxic Chemicals: Not listed.

RCRA Status: Not listed.

EINECS Number: 231-598-3

ENCS Number: 1-236

ECL Serial Number: KE-31387

SWISS Number: G-2580

HMIS Rating: 1 0 0 A

State Regulatory Information

| Company Name/Cas Number | Concentration | State Code |
|-------------------------|---------------|------------|
| N/A | | |

16. OTHER INFORMATION

| | |
|--------------------------|------------------------|
| Reason for Issue: | Regulatory compliance. |
| Prepared By: | Steve Karl |
| Approved By: | Sarah Hubert |
| Title: | Technical Director |
| Approval Date: | March 2012 |
| Supersedes Date: | July 2010 |
| MSDS Number: | ND7 |

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It is the responsibility of the user to comply with all applicable Federal, state and local laws and regulations. It is also the responsibility of the user to maintain a safe workplace. The user should consider the health hazards and safety information provided herein as a guide and should take the necessary steps to instruct employees, and to develop work practice procedures to ensure a safe work environment.

This information is not intended as a license to operate under, or a recommendation to practice or infringe upon any patent of this Company or others covering any process, composition of matter or use.

WATERGROUP

WGR Series

Reverse Osmosis System

Installation, Operation, and Service Manual

WGR-150

WGR-300

WGR-450

WARNING

This Reverse Osmosis System contains a preservative solution to prevent microbiological growth and freezing which if ingested, may cause irritation of the gastrointestinal tract, colic, diarrhea or other similar symptoms. Therefore the unit should be flushed for 2 hours prior to use. The water should be disposed of immediately.

Revised 5/14/98

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Introduction To Reverse Osmosis (RO)

Common Terms & Definitions

Feed Water - The water that is introduced to the RO membrane for purification.

Product Water - The purified water produced by the RO unit.

Waste Water - The water that does not pass through the RO membrane. This water is to be directed to a drain.

Membrane - The fabric that the feed water passes through to become product water. It is usually a large surface area sheet that is spiral wound into a tube shape. It has channels for product flow and removal once the feed water has passed through the membrane.

Module - This is the completed package with the RO membrane installed inside the pressure vessel.

Gallons per Day (GPD) - RO systems are normally sized with this rating. A 450 GPD rating means this unit could produce 450 gallons per day of purified water at a given temperature.

TDS - Total Dissolved Solids. This is a measure of product water purity, measured in parts per million.

Parts per Million (ppm) - The measure of TDS. The parts of Total Dissolved Solids per one million parts of water (i.e. one pound of mineral salts dissolved in one million pounds of water will give one part per million of TDS).

Percent Recovery - The amount of feed water that passes through the membrane to become product water (i.e. If 1000 gallons of feed water are introduced to the RO system and 500 gallons of product water are produced then the percent recovery would be 50%).

Percent Rejection - The amount of total dissolved solids or chemicals rejected by the RO membrane.

Turbidity - Suspended biological, inorganic and organic particles in water which may be in sufficient amount to make the water seem cloudy.

How Reverse Osmosis Works

Osmosis is the process by which water moves across a semi-permeable membrane from a low concentration of solute to a high concentration of solute. Reverse osmosis depends on the presence of a barrier or membrane that is selective so that solvent of a solution can pass through the membrane while other components of the solution cannot. The osmotic pressure is the pressure required to stop the flow of solvent through a semi-permeable membrane separating two solutions of different concentrations. To separate water from dissolved solids by reverse osmosis, the applied pressure must be greater than the osmotic pressure.

Reverse osmosis is the finest level of filtration available. The RO membrane acts as a barrier to all dissolved salts and inorganic molecules, as well as organic molecules with molecular weight greater than approximately 100. Water molecules on the other hand pass freely through the membrane creating a purified product stream. Rejection of dissolved salts is typically 95% to greater than 99%.

Factors Affecting Performance

Permeate flux and salt rejection are the key performance parameters of the reverse osmosis process. They are mainly influenced by variable parameters such as; pressure, temperature, recovery, and feed water salt concentration.

Pressure

Increased feed water pressure will increase permeate flux and decrease the permeate TDS. With excessive pressure the membrane may become deformed or compacted and a decrease in product flow will result.

Temperature

Increased temperature will increase permeate flux, which increases salt passage. It is also important to note that every unit is rated for a product flow temperature of 77°F (25°C). With a temperature decrease, the product flow will decrease. On average the membranes lose about 2% production for every degree below 77°F.

Recovery

The recovery is the ratio of the permeate flow to the feed flow. When recovery is increased, the permeate flux will decrease and the salt passage will increase.

Feed water Concentration

Increased TDS or salt concentrations will decrease permeate flux and increase salt passage. This can also lead to surface coating or fouling by the salt.

Bacteria

If bacteria is allowed to grow on the membrane it will digest the top layer of the membrane and reduce the ability of the membrane to reject salt.

Hydrolysis

This is the effect of chemicals in the feed water on the membrane. This happens when the water temperature is high and the pH of the water is above 7 and below 2.5. To achieve optimum membrane life, a pH between 5 and 6 should be maintained.

WATERGROUP WGR Series Specifications

| Model | Membrane Element | Number of Elements | Motor HP* |
|----------------|-------------------------|---------------------------|------------------|
| WGR-450 | FILMTEC - TW30-2521 | 1 | 1/3 |
| | FILMTEC - TW30-2514 | 1 | |
| WGR-300 | FILMTEC - TW30-2521 | 1 | 1/3 |
| WGR-150 | FILMTEC - TW30-2514 | 1 | 1/4 |

*(115 V, 60 HZ, 1 pH)

| Filters | Size | Type |
|------------------------|-------------|-------------|
| Sediment Filter | 10" | 5 µm |
| Carbon Filter | 10" | GAC |

Operating Limits

| Membrane Type | Thin Film Composite |
|--|----------------------------|
| Maximum Operating Pressure | 200 psi |
| Feed Line Pressure Min./Max. | 30-85 psi |
| pH Range, Continuous | 2 - 11 |
| Feed Water Hardness | <10 gpg |
| Feed Water Iron | <0.1 ppm |
| Feed Water Manganese | <.05 ppm |
| Feed Water Hydrogen Sulfide | must be removed |
| Chlorine Tolerance | 0 ppm |
| Organics Tolerance | 0 ppm |
| Oil Tolerance | 0 ppm |
| Maximum Allowable Back Pressure | 40 psi |
| Operating Temperature | 40-110 °F |
| Maximum Feed Turbidity | 1 NTU |
| Maximum Feed Silt Density Index | SDI 5 |
| Maximum TDS | 2000 ppm |

Note: Operating in excess of these conditions may result in more frequent cleaning or premature failure of the membrane. The limited warranty will become void if failure or reduced performance is due to improperly treated feed water

System Components

1. Feed Water Pressure Gauges

The inlet pressure gauge reads the feed water pressure. The second pressure gauge, after the sediment filter and carbon filter, reads the water pressure entering the process pump. As the filters become clogged, a pressure drop will develop across the filters. A pressure drop of 7 psi or more will indicate the need to check or replace filters.

2. System Pressure Gauge

This gauge indicates the water pressure that is being discharged by the pump and applied to the first R.O. membrane. The recommended system operating pressure is 200 psi. This should not be exceeded.

3. Process Pump

The R.O. unit uses a rotary vane positive displacement pump. It has a brass external housing with stainless steel internal components. Maximum discharge pressure for the pump is 200 psi.

4. Operating Pressure Control

The maximum system operating pressure is controlled by a built in by-pass in the positive displacement pump. The pump is factory pre-set for 200 psi. In the event an adjustment is required, turn the slot blade screw to the right for higher pressure and to the left to decrease the pressure.

5. Pump Motor

The electrical service required for the motors is 120 V, 60 HZ, single phase. Verify that available power exactly matches the voltage, hertz, and phase on the motor name plate before connecting any power to the unit. Connecting the unit to a power source which does not match the unit power rating exactly may cause damage and void the warranty.

6. Low Pressure Switch

The low pressure switch will automatically shut down the system should the feed water pressure drop below 15 psi. The system will re-start when the pressure rises to 25 psi. Operating the system below feed water pressure of 20 psi will cause pump damage.

7. Tank Full Switch

The system is designed for pressurized storage tank system. The system will shut down when the storage tank pressure reaches 50 psi. It will re-start when the storage tank pressure drops below 30 psi.

8. Float Switch (optional)

The system can be used in conjunction with an atmospheric tank as well. A float switch installed in the tank will measure tank level and turn the RO system on when levels are low and off when levels are high.

9. Pressure Regulator

This valve controls of the amount of concentrate being recycled to the feed inlet of the pump. It is also used to fine tune and adjust the system pressure. **WARNING - DO NOT TURN THE PRESSURE ADJUSTMENT ALL THE WAY OUT. IT WILL COME OFF THE THREADS AND MAY CAUSE INJURY BY SHOOTING UPWARDS.**

10. Pre-Filter

This filter is a 10" sediment filter that removes suspended particles such as dirt or scale down to 5 micron in size.

11. Carbon Filter

This is a 10" granular activated carbon filter. It removes chlorine from the feed water. Chlorine will attack and destroy thin film composite membranes.

12. Inlet Solenoid Valve

This 1/2" normally closed solenoid valve opens to allow feed water into the system when feed pressure rises above 25 psi and shuts off when pressure falls below 15 psi to ensure that damage does not occur to the pump.

13. Manual Flush Valve

This 1/4" ball valve can be manually opened when the unit is in operation to fast flush the membranes. The waste water is diverted through a bypass around the waste water valve and recycle valve to drain.

NOTE: Open and close valve slowly as system pressure is reduced and increased greatly during operation of the flush valve.

14. Pre-Filter Isolation Valve

This 1/4" ball valve is the inlet connection for the feed water to the system. It allows the feed water to be turned off directly on the unit.

Installation Instructions

Important: The WGR system must comply with all local plumbing, sanitation, and electrical codes. Obtaining permits and meeting codes is the responsibility of the installer.

Location

The WGR system should be positioned in a suitable location near inlet water, drains, and electrical outlet. The unit should be located indoors on a solid level base which can support the weight of the unit. Allow enough space for servicing of the unit and removal of the membranes.

Install the unit away from direct sunlight in a well ventilated location. Ensure that the system is protected from weather or excessive dust.

Dimensions: height -- 30"
width -- 15"
Depth -- 18"

Water Supply Connection

Caution: Use only Non-Ferrous materials when connecting the water supply to the WGR system. Iron is detrimental to the membrane and causes fouling and pre-mature failure of the membrane.

The water supply connection is 1/4" FNPT on pre-filter isolation valve. Run 1/2" or 3/8" softened water supply line to the valve.

Product Water Connection

The WGR system comes with 10 ft of blue 3/8" tubing running from the product water flow meter. This tubing is to be connected to the storage tank using 3/8" compression tubing fittings.

Reject Water Connections

The WGR system comes with 10 ft of black 3/8" tubing running from the waste water flow meter. This tubing should be run to a suitable drain (floor drain or stand pipe) This connection should include a proper air gap to prevent possible

back flow. (Consult local plumbing codes) Ensure that the drain line tubing is fastened securely. When the system goes into fast flush mode, considerable pressure is applied and the tubing may come loose.

Electrical Connections

Verify that the available power exactly matches the voltage, hertz, and phase specified on the systems name plate before connecting any power to the unit.

Caution: Connecting the unit to a power source which does not exactly match the unit power rating exactly may cause damage and void the warranty.

Float Switch Connections

A float switch can be supplied by the manufacturer for this system. The float switch will come with a plug in that the RO unit plugs into. The other end of the piggy back then is plugged into the wall outlet. This will cut power to the RO unit when the atmospheric tank is full and restore power when tank is empty. The mechanical float switch works on a 45 degree angle for pump on and off levels.

Optional

A float switch may be connected to this system for use with an atmospheric tank. Remove the pressure switch covers from both the low pressure and tank full switches. Disconnect the black wire at both ends of the cable connecting the two pressure switches. Connect the black and white wires of the float switch to the pressure switch where the old black ones were. Replace the pressure switch covers.

Start-up Procedure

Before running the RO system the granular activated carbon filter has to be flushed. To do this place the carbon filter into the first filter housing and leave the second filter housing removed. Place a bucket under the second filter top to catch runoff. Open the pre filter isolation ball valve and flush for 2 minutes. Throw waste water away. Once the carbon filter has been washed install it in the second housing and replace the sediment filter into the first housing.

Pre-Start Check List

1. Sediment filter and Carbon filters in place.
2. Minimum inlet pressure 30 psi.
3. System is plugged into proper electrical supply.
4. Black waste water and blue product water lines are connected to drain and storage tank.
5. Carbon filter has been flushed to remove excess carbon.
6. Open pressure regulator almost completely. **WARNING - DO NOT TURN THE PRESSURE ADJUSTMENT ALL THE WAY OUT. IT WILL COME OFF THE THREADS AND MAY CAUSE INJURY BY SHOOTING UPWARDS.**

Start-Up

1. Open pre-filter isolation valve.
2. Check that the manual flush valve is in the open position. The valve is open when the handle is in line with the valve.
3. Immediately monitor the system pressure gauge to insure that the system does not exceed 200 psi.
4. With pump running, slowly close the manual flush valve. Immediately monitor the system pressure gauge to insure that the system does not exceed 200 psi.
5. With pump running, slowly close the pressure regulator until the system pressure reaches 150 psi. Observe that as the regulator is closed, the system pressure increases. Do not let the system pressure go over 200 psi. If necessary, open the regulator to lower system pressure. By continuing this fine tuning process, the desired system pressure can be achieved.
6. To check the operation of the low pressure switch, slowly close the pre-filter isolation valve. The system should shut down at 15 psi. Slowly open the valve and the system should initiate start-up at 25 psi.
7. Leave the system running until the storage tank fills to ensure proper operation of the tank full switch.
8. The system should stabilize after 20-30 minutes of operation.

Maintenance

Pump

The process pump requires no regular maintenance. When the pump becomes noisy or 190 psi system operating pressure cannot be maintained, the pump should be replaced. At operating pressures above 190 psi, the life of the pump is reduced. If the feed water is very high in TDS the bypass pressure regulator on the pump may be scaling up causing water to bypass in the pump. Remove the acorn nut on the bypass and clean any scale off. If pressure does not return to normal, replace the pump.

Reverse Osmosis Membranes

The condition of the membranes is indicated by comparing the current permeate water quality (TDS) and production to the baseline permeate quality and production values that were established upon initial installation.

Flushing Membrane

Organic and or mineral sludge tends to build up on the surface of the membrane that can reduce its performance. Open the manual flush valve located on the back of the system slowly and let the unit fast flush for five minutes. Once a week flushing is helpful. In some cases, once a day flushing may be desired to control odor from organic build up.

Membrane Removal and Replacement

Disconnect all piping connected to the membrane at the point closest to the membrane. Remove the membrane and housing from the RO unit. Remove the 'U' bolt at the bottom of the membrane. The end cap will only have one hole. This should be the high pressure end. This end has a brine seal which forces the water to pass through the inside of the membrane. Carefully remove the end cap from the vessel using a pulling/twisting motion.